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HERE'S proof that neither the name Dr. C. B. F. Young nor H. Leroy Beaver is a phantom of our masthead. If you will first turn to page 22, you'll find evidence of the way Dr. Young can write technical material with interest—especially for those engaged in gold plating. This article is characteristic of Young's work, but that is what you have a right to expect from him. In the vernacular, electroplating is right up his alley. This article is entitled "Determination of Gold in Plating Solutions" and is just as important as the name implies. Should any part of it be a little over your head, remember that the author will give further explanation.

De-Burring is a "must" in the metal-finishing field, especially since war production humped things up to a faster tempo. Hence, it was natural for us to coax H. Leroy Beaver back on our editorial staff to tell our readers about the newest developments in barrel finishing. The name "Beaver" and barrel finishing are synonymous—at least, they should be considering the aptitude this writer has in his specialized field. On page 36 under the simple title "De-Burring" you will find Beaver's latest contribution to the metal-finishing field.

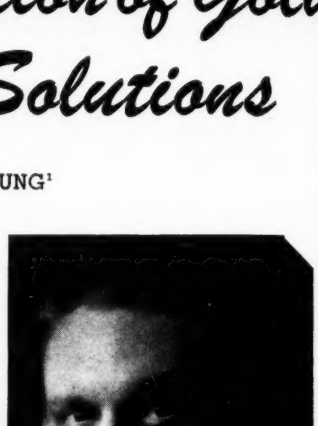
Jeffrey R. Stewart, our versatile editor on organic finishing, acquaints you with some important "don'ts" which will help to free your paint and lacquer finishing departments from accidents. We can't stress safety too much at any time and especially when there is a manpower shortage. Turn to page 48 and get Stewart's slant on safety.

Down-to-earth information written in understandable terms on the subject of the chemistry of electroplating starts with our October issue. Again Dr. Young contributes from his vast store of knowledge about electrochemistry to give the electroplater a fundamental knowledge of the theories underlying chemistry so that he can apply the same for better work in the plant. This will start a series of articles by Dr. Young —about 12 in all. Better file your copy of PRODUCTS FINISHING for future reference; later it may be hard to get duplicate copies.

The Determination of Gold in Plating Solutions

By DR. C. B. F. YOUNG[1]

IN the plating plant many times a fast and fairly accurate method for determining gold is desired. On searching the literature one will find that there are few if any methods which fill these requirements. As a general rule the determinations used for this metal are designed for very accurate analysis and generally for very small quantities of the material being present. In the plating plant, a concentrated solution containing one to four grams/per liter of the metal is employed. Realizing the situation above existed, the author had a research fellow[2] to investigate several possibilities.



On investigating the literature one can see that gold can be determined gravimetrically by precipitating by oxalic acid; ferrous sulphate, hydrazine hydrochloride, and so on. The metal when precipitated is allowed to collect and then the whole filtered on a Gooch crucible or ashless filter paper, dried and weighed. This method is used in many laboratories as a standard one because of its accuracy. However, it requires analytical weighings and is time-consuming.

The electrolytic method can be used for estimation purposes, but no ferrocyanides should be present. At least three hours are required for the deposition process alone.

There are colorimetric methods for determining gold, but most of these require a technique known generally to a few laboratory technicians. Snell[3] has given a list of reagents used to determine gold in solution. Among these are stonnous chloride, formaldehyde, phenylhydrozine, benzidine, dimethylaminobenzylidenerhodonine, acetylene, mercurous chloride, o-tolidine, and metaphenylene diamine.

A good example is the use of formaldehyde for determining gold:[3] "To 50 cc. of sample add sufficient 20 per cent sodium hydroxide solution for neutralization and 1 cc. in excess. On addition of 1 cc. of 40 per cent formaldehyde a blue color is developed. The investigators of the method were able

to use the balance method, but recommended colored glass standards. The optimum concentration for this determination is 1 part in 40,000."

Another good example[3] is phenylhydrozine. "To the sample add 1 gram of citric acid and 5 drops of a 10 per cent solution of phenylhydrozine hydrochloride. A blue violet by transmitted light is obtained. This will detect one part in two million. Comparison with a series of standards is advisable. Such standards keep several hours, but eventually give a black deposit." Such methods offer little possibilities in the electroplating plant.

Volumetric methods are fast and accurate. However, those used for the determination of gold have several handicaps. Among them are tricky end points, back titration, and dilute samples required. It might be well to review some of these methods here:

In general, nitric acid or nitrates should be removed by evaporating several times the solution to a syrupy consistency while hydrochloric acid saturated with chlorine is added. Free chlorine or bromine is precipitated by the addition of ammonia until a permanent precipitate occurs, then slightly acidifying with hydrochloric acid and heating until the precipitate dissolves. Care should be taken so that little free acid remains. Too great excess should be neutralized with ammonia.

Scott[4] gives several volumetric methods after the sample has been prepared as above. These are given verbatum below:

PERMANGANATE METHOD

"Weak gold solutions should be concentrated whenever possible.[5] The permanganate method, which is not applicable when the sample contains organic matter, depends upon the titration (after complete precipitation of gold) of the unoxidized portion of a measured quantity of an added reagent of a known gold-precipitating value. The reagent may be ammonium or potassium oxalate, ferrous sulfate or ferrous ammonium sulfate in solutions varying from 5 to 25 milligrams gold precipiating value and is titrated with permanganate solution of approximately equal oxidizing strength. One part of gold requires for precipitation 1.08 of ammonium oxalate, 1.40 of potassium oxalate, 4.22 of ferrous sulfate, 5.96 parts ferrous ammonium sulfate, each in crystalline form. The most satisfactory precipitations are made with the iron salts. The standard solution of either should contain about 0.1 per cent of sulfuric acid. One part of gold, in solution as auric chloride, has an oxidizing value equivalent to 0.4808 part of potassium permanganate."

"The precipitating value of 0.2548 gram of dry Sorenson's sodium oxalate is 250 milligrams of gold, and by titrating a solution of this amount of oxalate in 250 ml. of water, acidulated with a few drops of sulfuric acid, the oxidizing value of the permanganate solution is obtained in terms of gold."

"The value of the precipitating reagent and relative oxidizing value of the permanganate solution can be checked very accurately by adding a measured quantity of the reagent to an excess of gold chloride, filtering, washing thoroughly, incinerating and weighing the precipitate obtained in a tared porcelain crucible."

"Procedure.—In carrying out the determination of a gold solution, a measured or weighed portion is freed of oxidizing agents, a measured amount of the standard precipitating reagent added in slight excess of the amount required to decolorize the solution, and digestion on a steam bath or hot plate continued until the gold settles out, leaving a clear liquid. A few drops of sulfuric acid may be then added and, without filtering, titration performed. The gold

value of the quantity of reagent added, minus that found of the excess of reagent, is the gold content of the amount of the sample taken."

IODIDE METHOD

"Small quantities of gold are determined by Gooch and Morley's iodide method.[6] A measured or weighed portion of the gold solution is treated, as has been described for removal of oxidizing agents, with an excess of free hydrochloric acid. Potassium iodide solution is run into the cold liquid until the gold precipitated as aurous iodide is completely dissolved. Starch solution is then added, and the amount of N/1000 thiosulfate required to decolorize the liquid noted. From this amount is deducted the amount of N/1000 iodine required to just produce a perceptible rose tint in the liquid."

"The reactions involved are $AuCl_3 + 3KI = AuI + I_2 + 3KCl$ and $I_2 + 2Na_2S_2O_3 = 2NaI + Na_2S_4O_6$."

"The gold value of the N/1000 solution of sodium thiosulfate should be determined by performance of the operations of the method on a known quantity of gold, similar in amount and contained in a volume of solution approximately equal to that of the analysis."

"Lenher's Method. — By Lenher's method[7] of determining gold in solutions free of oxidizing agents, sulfurous acid of a reducing strength of 2-5 milligrams gold per ml. is used as the reagent. The sulfurous acid requires frequent standardizing by means of standard iodine or potassium iodide to which a definite amount of standard permanganate has been added or by a gold solution of known strength. Using starch as indicator, the iodine liberated by addition of potassium iodide can be titrated by sulfurous acid. Bromine liberated by potassium bromide according to the equation, $AuCl_3 + 2KBr = AuCl + 2KCl + Br_2$, can be titrated by sulfurous acid. Excess of magnesium or sodium chloride gives to auric chloride a yellow color which by sulfurous acid can be titrated to the colorless or aurous state. These alkaline salts do not interfere in the potassium bromide or iodide reactions."

The permanaganate method consists of precipiating metallic gold from the auric chloride solution which contains no nitric acid or nitrates using as the precipitating agent an excess standard of a reducing agent such as ferrous sulphate. For example:

$$AuCl_3 + 3FeSO_4 = Au + Fe_2(SO_4)_3 + FeCl_3$$

After digestion in a steam bath the excess reducing agent is titrated with potassium permanganate.

Peterson[8] has suggested a method based on the reaction of auric chloride and potassium iodide in which free iodine and aurous iodide are produced. Thus

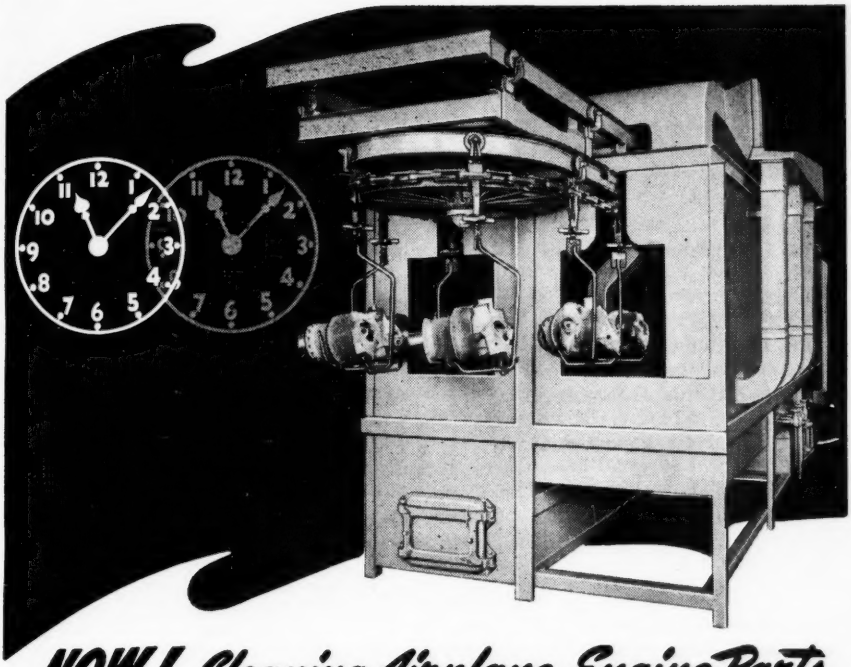
$$AuCl_3 + 3KI = AuI + I_2 + 3KCl$$

In using the iodide method of Gooch and Morley for more concentrated solutions of gold, Rupp[9] held that the difficulty was due to instability of aurous iodide which dissociated into metallic gold and iodine. He also precipitated metallic gold from the trivalent state, using a standard arsenious acid solution thus:

$$3As_2O_3 + 4AuCl_3 + 6H_2O = 3As_2O_5 + 12HCl + 4Au$$

Here the solution is heated until all the collodial gold has been knocked down and completely precipitated. The resulting acid is neutralized with sodium bicarbonate and the excess arsenious acid titrated with standard idodine, using starch as the indicator.

Pollard[10] proposed using the aqua regia solution directly by titrating the auric gold with arsenious acid, thereby reducing the gold to the metallic state. In order to reduce the gold from the auric to aurous state a catalyst of potassium iodide and mercuric chloride is added, while potassium bromide helps reduce the au-



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rous to the metallic state. Potassium bromide also forms complex bromo-auric acid, the color being removed by the titrating agent, arsenious acid.

The following reactions should be considered:

$$3HCl + HNO_3 = Cl_2 + NOCl + 2H_2O$$

On dilution the NOCl recombines

$$NOCl + Cl_2 + 2H_2O = 3HCl + HNO_3$$

Before dilution there is an excess of NOCl, and after there is HNO_2 + HCl, thus

$$NOCl + H_2O = HNO_2 + HCl$$

On dissolving in aqua regia gold goes into the auric state

$$Au + 4HCl + HNO_3 = HAuCl_4 + 2H_2O + NO$$

The dissolved gases must be removed after the gold has been dissolved. The above is accomplished by bubbling air through the solution. This prevents error due to partial reduction of the auric gold to aurous gold when the solution is diluted due to the excess nitrosyl chloride originally present. Next some urea and potassium bromide solutions are added. A trace of HNO_2 is removed by the urea. This would catalytically start the reaction between hydrochloric and nitric acid,[3] which in time would redissolve the precipitated gold. Then the solution is heated 40 degrees C. and titrated with the standard solution containing arsinious oxide, mercuric chloride, a small amount of potassium iodide and some free hydrochloric acid. Iodine is liberated by the auric gold and then reduced back to iodide by the arsenious acid.

In an acid solution an equilibrium exists between arensious acid and free iodine. Thus

$$As_2O_3 + 2I_2 + 2H_2O \rightleftharpoons As_2O_5 + 4HI$$

If an excess of mercuric chloride is present, the equilibrium is shifted to the right due to formation of the complex, $HgCl_2 \cdot HgI_2$. Also the low concentration of iodide will not reduce such metals as copper, iron and

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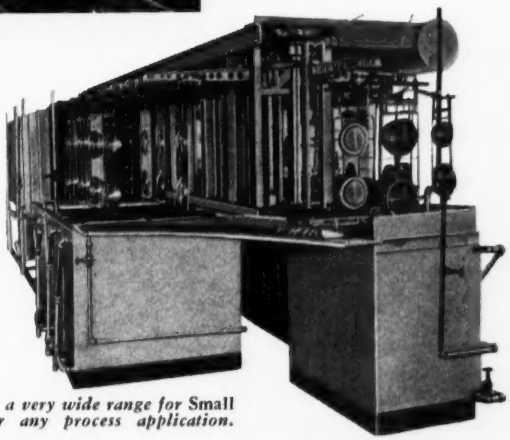

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A precipitate of metallic gold produces an opaque solution, but this can be removed by passing cold air through the mixture for a short period and then allowing it to settle.

When the brown color of bromo-auric acid is eliminated, there is still a small amount of gold in solution. This can be determined by titrating with hydroquinone solution, using an indicator consisting of sodium fluoride and o-tolidine or o-dianioidine. Sodium fluoride forms a colorless complex with any iron which may be present. It should be mentioned that ruthenium interferes with this method by producing a strong colored solution which obscures the endpoint.

Pollard's method is fast and accurate, but there are objections to it as follows: The gold in precipitating has a tendency to obscure the endpoint, and there are two standards used. It is believed that the method given below eliminates these bad points.

In this method the gold is put into aqua regia solution and then sodium hypochlorite or potassium chlorate is added. The solution is diluted and boiled until all free chlorine is eliminated. The acid is neutralized with an excess of sodium bicarbonate and potassium iodide is added. The liberated iodine is titrated with standard sodium arsenite, using starch as an indicator if desired.

From the above it will be seen that the generated nitrosyl chloride which will act as a reducer is removed by introducing more chlorine, then adding water and boiling out the excess. Chlorine is liberated by the addition of sodium hypochlorite solution or potassium chlorate. Thus

$$NaOCl + 2HCl = NaCl + H_2O + Cl_2$$

$$KClO_3 + 6HCl = KCl + 3H_2O + 3Cl_2$$

In a warm concentrated acid solution effervescence is rapid when using potassium chlorate, and mild in 50 per cent acid solution.

When the acid is neutralized the gold stays in solution. When potassium iodide is added to the bicarbonate solution, the gold is reduced to the aurous state and remains in solution as the iodide complex and iodine are liberated.

Auric gold, when treated with sodium bicarbonate, may oxidize free iodine. It will be noted that if a small amount of potassium iodide or iodine solution is added to the gold solution, the expected color with starch solution fails to appear. However, if potassium iodide solution is added quickly and in large excess with agitation, no appreciable error is produced.

When iodine is titrated with arsenite solution, a quantitative reaction takes place in bicorbonate solution. The reaction is fast and produces a sharp end point. Starch may be add-

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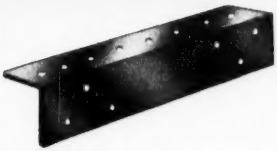

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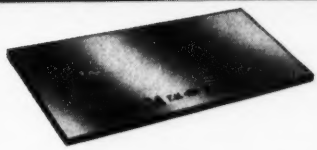

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ed if desired. Excess arsenite does not precipitate metallic gold. Copper, iron, and other base metals do not interfere when present by reacting with potassium iodide as they form basic carbonate precipitates. However, if colored salts are produced, they may have a tendency to obscure the endpoint. Platinum and palladium do not cause liberation of iodine but do produce colored iodide complexes which hide the endpoint. The color, similar to that of free iodine in potassium iodide solution, is removed by arsenite only when a large excess is added.

The standard arsenite solution is prepared as follows:

If 0.01 N solution is desired, dissolve 0.0495 gram of pure arsenious oxide in a little 20 per cent sodium hydroxide. Neutralize the excess alkali with dilute sulfuric acid, using phenolphthalein indicator, until the solution is just decolorized. Add 500 ml. of distilled water containing about 25 grams of sodium bicarbonate. If a pink color develops, remove it with a few drops of weak sulfuric acid. Dilute the solution to 1000 ml. and standardize it against a weighed amount of pure gold. The arsenite retains its strength practically indefinitely.

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RECOMMENDED PROCEDURE

If[2] the gold content of a solution is to be determined, take with a pipet a sample containing about 40 mg. of gold. (Assume this to be 20 ml. or less.) In a fume hood add 15 ml. of concentrated hydrochloric acid and 5 ml. of concentrated nitric acid, and heat briefly. Remove flame and add 25 ml. of 5 per cent sodium hypochlorite. This will be accompanied by a mild effervescence of chlorine gas. Add 35 ml. of distilled water and boil gently for 10 minutes. Cool, and neutralize the acid with a saturated solution of sodium carbonate or with a solution of sodium hydroxide, testing by touching the stirring rod to the edge of litmus paper. Adjust to slightly acid with dilute hydrocloric acid. Add a saturated solution of sodium bicarbonate until the gold solution reacts blue to litmus. Dissolve a few grams of potassium iodide in some distilled water and add the iodide rapidly, with stirring, to the gold solution. Add a few grams of sodium bicarbonate to ensure the presence of a sufficient excess, and titrate the liberated iodine with standard 0.01 N arsenite. Add a few milliliters of starch indicator solution when the iodine color becomes faint. The end point is the complete disappearance of the starch-iodine color.

The same procedure is applied to a solid, such as a gold alloy, the accurately weighed out sample of which is heated in the aqua regia until it dissolves.

If potassium chlorate is used instead of sodium hypochlorite, the recommended procedure is altered as follows: Add 1.0 gram of the material,

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heat the solution briefly, allow it to stand about 5 minutes while effervescing, dilute with 60 ml. of water, boil gently 10 minutes, and so on. The excess chlorine is removed readily from the diluted solution by gentle boiling.

EXPERIMENTAL

The standard solutions were prepared in the manner previously described by dissolving 5.0063 grams of arsenic trioxide and making the solution to volume, 1000 ml. The normality, 0.1012 N, was checked by standardization against a weighed amount of pure iodine. By proper dilution of the more concentrated solution, 0.01012 N arsenite was prepared. On the basis of equations given above, the latter equation, of course, going completely to the right, 1.000 ml. of the 0.01012 N arsenite was theoretically equivalent to 0.998 mg. of gold.

The samples in experiments I, II, V, VI, and VIII were pure gold. The sample in experiment III was taken with a 1.00 ml. pipet from a solution of potassium aurocyanide, $KAu(CN)_2$, known to contain 20.3 mg. of gold per ml. Since phosphate is often present in industrial gold-plating solutions, pure gold was taken in experiment IV and 0.3 ml. of phosphoric acid was added to see if the latter would interfere. To the pure gold sample of experiment VII were added 10 mg. each of copper, iron, silver nitrate, and nickel to test for interference.

The author would like to thank Mr. Victor Herschlag, who did the experimental work on the recommended procedure. The author would also like to thank Mr. Benjamin Robinson of A. Robinson & Sons, who cheerfully financed this research, which was carried on at the Institute of Electrochemistry & Metallurgy, New York, N. Y.

TABLE I
RESULTS WHICH ILLUSTRATE ACCURACY OF PROCEDURE

Expt.	Gold Taken Mg.	Arsenite Ml.	Gold Found Mg.	Deviation Mg.
I	18.9	18.81 (0.01 N)	18.77	— 0.1
II	19.4	19.19 (0.01 N)	19.15	— 0.2
III	20.3	20.33 (0.01 N)	20.29	0.0
IV	22.9	22.88 (0.01 N)	22.84	— 0.1
V	34.7	34.82 (0.01 N)	34.75	+ 0.1
VI	44.2	44.25 (0.01 N)	44.16	0.0
VII	233.7	23.38 (0.1 N)	233.4	— 0.3
VIII	410.2	41.00 (0.1 N)	409.2	— 1.0

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[2]Victor E. Herschlag. See also "A Procedure for Volumetric Determination of Gold," Ind. & Eng. Chem., Vol. 13, No. 8, Aug. 15, 1941, pp. 561-63.

[3]Snell, F. D., "Colorimetric Methods of Analysis," 2nd Ed., Vol. I, pp. 404-8, New York, D. Van Nostrand Co., 1939.

[4]Scott, W. W., "Standard Methods of Chemical Analysis," 5th Ed., Vol. I, pp. 436, New York, D. Van Nostrand Co., 1939.

[5]Boll Chim. farm., 30 (3), 35 (1894); Oesterr. Z. Berg.u. Hüttenw., 182 (1880); Sutton, "Volumetric Analysis," 10th Ed.; E. A. Smith, "Sampling and Assaying of Precious Metals"; Mining Eng. World, 37, 853 (1913).

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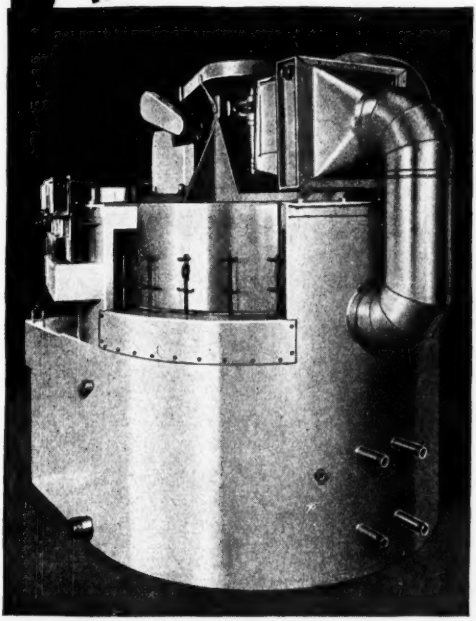

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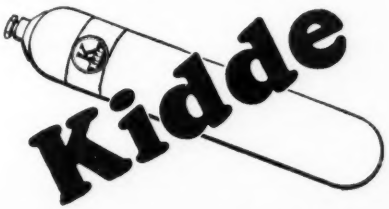

De-Burring

H. Leroy Beaver, a recognized authority in the field of finishing, and more especially barrel finishing, returns to the pages of PRODUCTS FINISHING with this issue. Many of our readers who profited through reading his earlier articles will welcome additional editorial material written by him. We are pleased to announce that he is now a consulting editor for this magazine.

IF a layman or anyone without experience in the field of metal finishing were to pick up a copy of any of the regularly issued periodicals that circulate generally throughout the manufacturing field and glance even casually through the advertising pages he could hardly help being impressed with all of the stress that for the year last passed has been placed on one single phase of metal finishing procedure and that is the matter of burring or perhaps more properly termed de-burring.

This subject is being treated just as though it was something new that had crept into metal finishing procedure with the advent of the step-up in production for the war effort, where, in reality, the subject is as old as metal finishing procedure itself.

Inasmuch as so very much stress has been placed on this phase, we have been asked to contribute something in the way of clarification. First, we expect that we should say that in any barreling operations discussed it is understood that reference is made only to parts that are susceptible to finishing in barrels and does not contemplate the finishing of parts that never should have been placed in a barrel for finishing in the first instance.

To undertake to finish some parts in barrels would be asking almost as much as to expect a horse to paint a masterpiece or to expect a cow to compose a symphony and yet it is on just such parts that claims are made that barrel finishing procedure could only result in ruined tolerances. This, of course, is not true as applied to that class of parts that lend themselves to barrel treatment and which is the only sort we have ever discussed.

Let us illustrate this in the case of the manufacture of steel balls for bearings. The ball blanks are first either hot or cold pressed and then put through a flashing operation to remove the equator fin that forms between the dies. After this they are first or rough ground, which roughly rounds up the ball blank. From this point on the major portion of production operations are carried on with barrels.

From the final grinding operation after the balls have been heat treated, barrels are used exclusively in reducing balls to proper size tolerances and also for providing the high surface finishes, and so accurately are these barreling operations performed

By H. Leroy Beaver

that balls in a wide range of sizes are finished in lots of from 600 to 1,000 pounds and held easily within tolerances of one one-hundred thousandth of an inch in sphericity and within one forty-thousandth of an inch in diameter, and such accuracy does not permit itself to be termed as any ruination of tolerance. Indeed, without the barreling operations on steel balls, the radial and thrust ball bearings which are so widely applied today would be all but impossible.

For the most part, de-burring operations are required on metal stampings. Here we have a peculiar situation. We have been called in for consultation in many plants where stampings are produced. Where the problem is one of removing burrs, the average manufacturer seems to reason that in some way everything that might have been done to a stamping from the raw material and all along down the production line, should in some miraculous way be all taken care of in one simple barreling operation, but it is not so easy as that.

The manner in which stampings are produced in some press shops, the character of the dies used and the quality of raw material represented in the strip, will create stampings that no amount of barreling operations could ever correct. Strangely, too, in practically all of such cases everything is blamed on the barreling operation, an operation purely inanimate in character. The barrel is expected to correct errors of men who can think and act supposedly intelligently, but who expect the inanimate barrel to do their thinking and acting for them. Two shops may be given identical blue prints made from the same tracing. One shop will sink and set their dies and produce stampings practically without burrs of any kind, while the other will produce stampings that might be better be used as scrapers.

We have rules for the preparation of dies where the clearances have been determined based on the degree of hardness as well as thickness of the material to be blanked and formed. If the dies are properly proportioned and set up, we are most likely to have less burr—hence quicker and more effective barreling procedure for their removal. We will not undertake to reproduce the series of tables covering such tolerance phases here, because they should be known generally in the stampings field.

Where parts are required to be produced in mass production quantities and held to certain close tolerances, then there is nothing to do but to actually plan definite tooling for the carrying out of the work. It is not sufficient to make the drawing and then the dies, making an all-around tolerance allowance and expecting the finished parts to remain at that exact tolerance throughout such barreling operations as may be required either to remove burrs or to create a radii on all edges of the parts.

Once the design has been approved, from six to twelve parts should be manually made in the tool room and as close to the blue print tolerances as possible. These parts should then be operated in the barrel with suitable de-burring materials. Parts may be removed at stated intervals and examined and when the desired result is secured, then the check parts should be carefully measured to determine just where the greatest amount of material has been removed. If the removal at a given point goes beyond the allowable tolerance, a change in the drawing will be required for correction by adding additional stock at that point to compensate for the excess material removed.

It has been claimed that in a barreling operation, material is removed in exactly the same proportion from every part of the pieces under treatment. With the single exception of round steel ball blanks, we have never subscribed to this claim.

However, when preliminary tolerance tests are made as herein indicated and then dies are made with the proper tolerance allowances, it will be found that the barrel will perhaps become a precision machine tool, and that the tolerances maintained in steel ball production can be just as well maintained on shapes and forms, and to a far greater extent than would be humanly possible even if each part were to be handled separately with wheels and compositions.

We have often wished that there might be some way whereby many manufacturers could once and for all dismiss from their minds the concept that there is no difference between the old and crude foundry rattler and the highly developed finishing barrel of the present. "Can we use our foundry barrel with stars to remove burrs from stampings?" is not an uncommon question. Of course you can't, and don't bother to try it. In spite of the fact that we have stressed this answer over and over again, it continues to bob up from all directions and we still have too many operators of barrels who insist on using hardened steel balls or steel shapes for de-burring operations, some with and some without accompanying abrasive materials.

So may we once again repeat that for effective de-burring operations, the steel balls or shapes must be dead soft annealed so that the burr will bite into the surface of the soft material and be literally wiped away. Hard balls or shapes produce the completely opposite effect and simply roll the burr down on the face of the part.

On many stampings, and depending on the character of the burr, the soft balls or shapes are all that will be required, but if it is felt that an abrasive is necessary, then by all means use what we would term a "soft" one; that is, a material that is friable, meaning that it will break down or pulverize quite easily as distinguished from the harder abrasives, or some one of the minerals whose hardness would be represented by ratings of four or not much over four on Mohs' Scale of Mineral Hardness.

We want, of course, to remove the burrs, but at the same time we also do not wish to disturb the natural surface skin of the metal any more than is absolutely necessary. If the material you select is sufficiently soft so that the burr on the parts can bite into it, then you may depend on the pressure developed within the mass as operated in the barrel to effectively remove the burr. This material should not be too fine in the beginning, but rather coarse in character, for at these hardnesses most of these minerals will fracture quite easily.

Faced with the necessity of making a choice between hard steel balls or steel shapes and some other and softer material, we are sure that we would be strongly tempted to take

finishes just wouldn't stand up—and the army said "No" to any bright metals in the field.

finishes just wouldn't stand up—and the army said "No" to any bright metals in the field.

The problem was to get a finish that had both endurance and low reflectance. The answer was: **ARMOR-VIT.** Here was a finish, available in olive-drab, gray or black, which was highly resistant to corrosion, rust, impact, scratching, abrasion, heat, thermal shock, alkalis, or acids. Its lusterless, matte finish provided the necessary camouflage.

Being a priority-free finish, **ARMOR-VIT** is making it possible for some manufacturers to substitute iron or steel for the more critical metals, such as chromium, zinc, nickel, cadmium, bronze, brass, tin, etc. Investigate **ARMOR-VIT** today. It has remarkable properties.

Although ceramic in nature, there is no comparison between **ARMOR-VIT** *and porcelain enamel, paint, lacquer or synthetic finishes. It is non-volatile, non-explosive. It withstands heat of over 1000° F., and is unaffected by the standard 200-hour salt spray tests, or weatherometer tests equal to 5 years normal weather.*

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our wheelbarrow out somewhere back of the factory, select some material that had the appearance of being mildly abrasive in character, and placing this in the barrel along with the parts, and with far greater assurance of getting a satisfactory result than if hardened steel materials, or chilled cast iron were used.

In this discussion thus far we have been thinking of parts that are required to be operated with some medium to act as a cushion, such as soft balls. We come now to another class of materials where such cushioning is not necessary. Generally speaking, the more regular the shape of the parts, the more susceptible they will be to finishing by acting as their own finishing agents. As the parts swing away from regularity in shape and form and become more intricate in design, then some form of cushioning is necessary to prevent deformation of the parts due to their tendency to lock together during the course of the barreling operation.

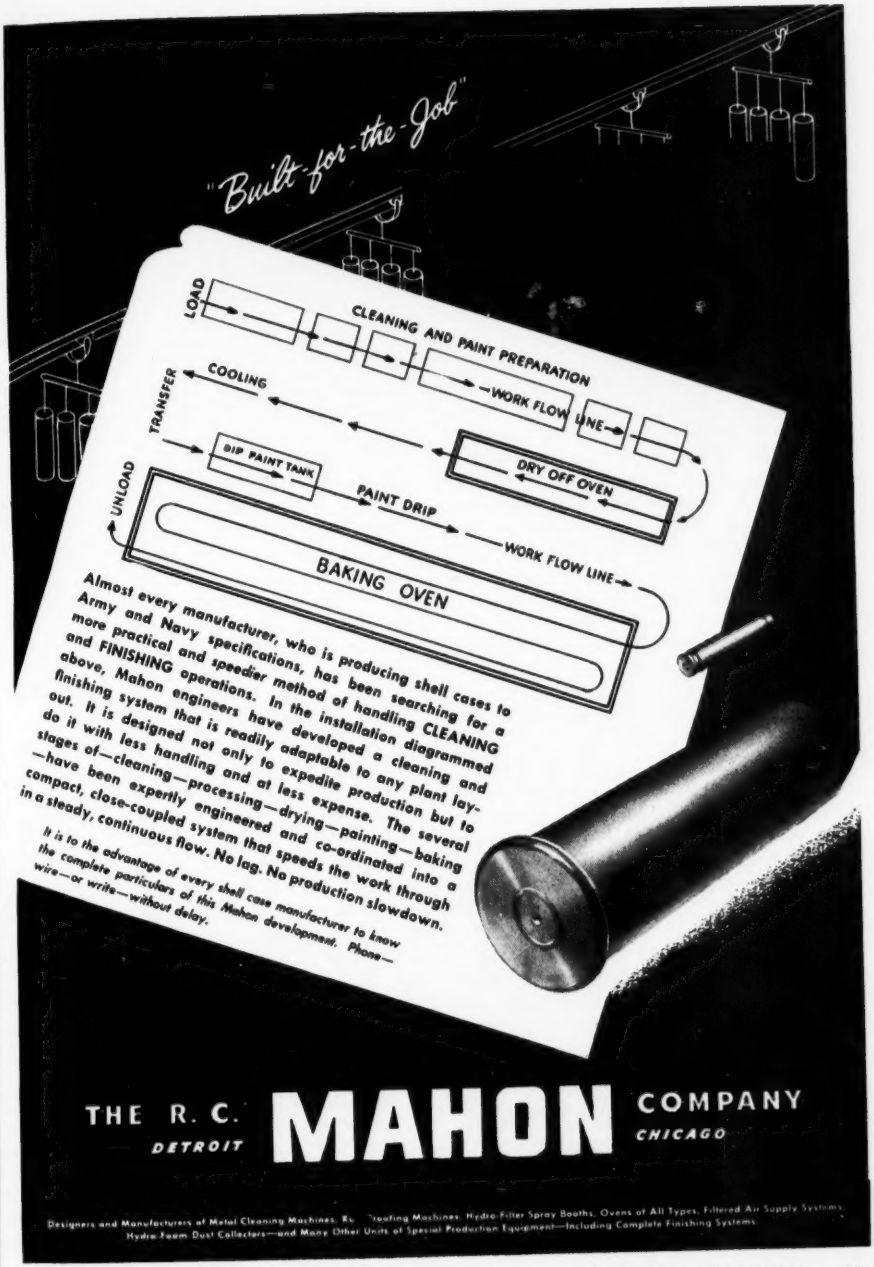
On the average, a barrel with a capacity of 1,000 pounds will be loaded with 500 pounds of de-burring materials and 500 pounds of parts to be de-burred. On self-operating parts this simply means that a full 50 per cent of the barrel capacity is wasted and where parts may be operated without cushioning materials, it is always best to do them that way in the interest of increased production. Only enough abrasive material, used with either water or oil, should be added to effect the wanted result.

In any barreling operation it is well to remember this rule: when deformation of the parts occurs, whether the operation be for de-burring or for polishing, it is rarely (if ever) caused by excessive load, but almost invariably by excessive barrel speed. To correct this condition, simply slow down the barrel until the deformation is no longer apparent. Where a wide variety of parts of different shapes are to be processed in the same plant, it is best to set the barrel speed at most effective one for the most intricate part and then let that be the speed for operation of all parts. The difference in the slower barrel speed will be more than compensated for in the better quality of your barrel finishing work, as judged from the final results.

Also, continuously comes the question, "What is the best barrel and who makes it?" Our answer is always the same. There is no such thing as a "best" barrel, but there is always a type of barrel that will function best on a given class of work. This whole question is confused by barrel manufacturers themselves because practically the same claims are advanced whether the barrels be high and narrow or long and narrow; whether they be high or low pressure, and whether of large or small capacity, but there is a deal of difference in the effectiveness of the various types depending on the parts and on the operations planned to be performed.

Maybe it would be too much to hope that we have heard the last word in the ridiculous argument that if only a small lot of parts are to be operated then use a small barrel, and if a large lot then use a large barrel. Irrespective of quantity to be operated, if a pressure of 1,000 pounds is required for adequate results, that pressure will be required whether one part or one thousand parts are operated per load, and don't let anyone try to convince you to the contrary.

Now comes a paragraph addressed especially to the "boss" of the works, his superintendent or department foreman, and here it is: The various parts constituting a metal finishing barrel can be cast, machined, assembled and set up ready for operation easily within a normal period of from five to six days. Now, what about an operator to handle that barrel?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CLEANING AND PAINT PREPARATION
WORK FLOW LINE
COOLING
TRANSFER
DIP PAINT TANK
DRY OFF OVEN
UNLOAD
PAINT DRIP
WORK FLOW LINE
BAKING OVEN
Almost every manufacturer, who is producing shell cases to Army and Navy specifications, has been searching for a more practical and speedier method of handling CLEANING and FINISHING operations. In the installation diagrammed above, Mahon engineers have developed a cleaning and finishing system that is readily adaptable to any plant layout. It is designed not only to expedite production but to do it with less handling and at less expense. The several stages of—cleaning—processing—drying—painting—baking—have been expertly engineered and co-ordinated into a compact, close-coupled system that speeds the work through in a steady, continuous flow. No lag. No production slowdown.
It is to the advantage of every shell case manufacturer to know the complete particulars of this Mahon development. Phone—wire—or write—without delay.
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Do you think that you can step out into the factory yard and select Demetrius, for example, from the laboring crew because he is big and husky, and then expect him without background of any kind to get results. Entirely too many of you have foundered on this rock already.

Barrel finishing procedure more often than not is a more intricate thing than you imagine and has many phases and most definitely requires an operator of what we would insist should be well above the average of ordinary intelligence. There are many barrel finishing problems, and especially in regard to de-burring procedures that can be quite easily answered by correspondence provided an adequate word picture is presented of just what the part is, the hardness of the material, the tolerance, methods of handling, nature of the material used in the barrel, the type of barrel and barrel speed and the length of the operating cycle.

Then, again, there are cases that refuse to respond to almost endless correspondence and that require a personal survey that involves an examination of the raw material and then every step in the manufacturing process right down to the actual barreling operation itself. Generally, the solution is found somewhere along the line and the trouble is such that no operator, however intelligent, could ever obtain satisfactory results until the particular condition had been corrected.

We do have much information of a very practical sort relative to both methods and materials, but under the present conditions we cannot consent to its publication. Much of it might have been discussed here and at this time. After all, we are at war, and we do not feel that definite descriptions covering either materials or methods should be broadcast. They are available to American manufacturers engaged in production for the war effort and any manufacturer engaged may present his de-burring problem fully and in complete confidence. It will be given most careful consideration and everything possible will be done to suggest an adequate solution.

As between the advocates of de-burring with wheels, buffs and compositions and barrel operations for the same purpose there is no serious argument or disagreement, for each has its proper place. It would be folly for any advocate of barrel finishing to insist that this was the only sensible way to do the work just as such a claim by the advocates of buffs, wheels and compositions to make any similar claim would be equally foolish.

Two factors loom largest in determining which method should be used, and these are weight of the parts and form of the parts. Now just where should the line be drawn that would indicate whether a part should be operated in a barrel or whether it should be operated with buffs, wheels and compositions? We have been trying to find some satisfactory answer or should we say rule for this question, and about a year ago we put the question to Mr. R. S. Leather, president of Lea Manufacturing Company, Waterbury, Connecticut. This organization has conducted a most exhaustive study of the action of wheels and composition of every sort in metal finishing procedure and can perhaps speak with as great an authority as any other concern similarly engaged. This is what Mr. Leather has to say on this phase:

> "I should say that barrel finishing ends at the point where the articles are too large for barrel work, or are too intricate. We have always considered that our burring operations are for articles that cannot be finished in a barrel. I don't suppose there is any real fine line that can be drawn."

We are still unable to define any

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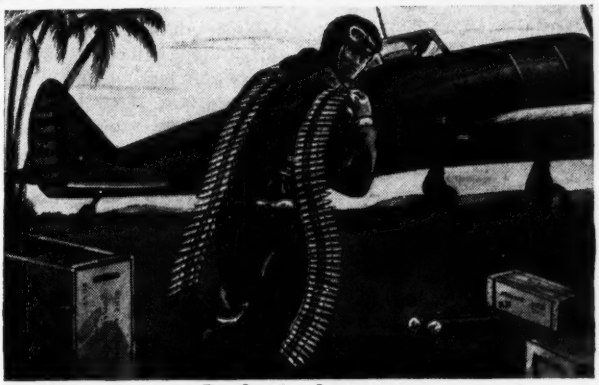

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exact rule to govern what should or should not be barrel-operated. We are continually faced with the question of not altogether whether the operation would be mechanically possible, but its equally important companion question of whether the operation would be commercially practicable. Almost daily we are asked regarding the possibility of finishing a given part in a barrel; whether it would be mechanically possible. We could easily answer "yes" to the greater part of these questions.

There are many intricate parts, some of quite large size, that could be operated in a barrel as single units provided ample cushioning material were used, but where it would be folly to undertake to operate multiples of the same part in a single loading for even at greatly restrained barrel speeds the impact of one part against another would cause damage that could not be repaired. Such parts lend themselves completely to individual handling with various types of wheels, buffs or compositions.

We would like to make the following suggestions, which, if followed, we believe will be of material assistance in determining the best method for solving the particular burring problem you have in hand:

1. Select one manufacturer of buffs, wheels and abrasive and polishing compositions.
2. Select one manufacturer of what we term the high and narrow type of barrel as originated by Abbott.
3. Select one manufacturer of what we term the long and narrow barrel as originated by Baird.
4. Select one manufacturer of a barrel who advocates the dry barrel finishing process as developed by Lupomatic.
5. Select one manufacturer of what is termed a pear-shaped barrel or more properly known as an oblique tilting tumbling barrel.

(There are sources of supply for all of the above from the Atlantic Coast as far west as St. Louis, Missouri, and naturally you should select the manufacturer nearest to your place of operation.

Now, of the parts you desire to finish, send at least 25 to each of the above classifications and with them, one sample part showing the finish that will be required to pass inspection, with the request that they finish the sample parts in the best manner they know with their equipment and return them along with a report of time required, material used, cost and size of equipment to turn out the production volume you require. This information should be of material assistance to you in determining the best method for use on your particular products. If you have never done anything like this, and if you do follow these suggestions, you, like many others to whom we have privately made the same suggestions, may be surprised at what you uncover.

These suggestions should be especially pertinent to those engaged in production for the war effort, for over and above every other consideration it is your plain duty to investigate the merits of these various methods and equipment. It may well be that you are using the one that for you is the least instead of the most efficient. You may be trying to accomplish with a barrel a job that should be most definitely be done with buffs, wheels and compositions or vice versa, and the time to find this out is right now.

Actex 200. Metal degreasing with Actex 200 is described in a folder distributed by The Du Bois Company, 1120 W. Front St., Cincinnati 3, Ohio. Eight "case histories" present data on the application of Actex for the removal of quenching oil, drawing compound, cutting oil, metal filings, rust proofing compound, soldering flux, carbon smut, and, in one case, prior to painting. Copy of this interesting folder free upon request.

AXELSON *insists on* QUALITY

Excerpt from a recent issue of Axelson CONTACT, published by Axelson Manufacturing Company, pioneer producer of oil well pumping equipment, engine lathes, gages, and aircraft parts, of Los Angeles, California.

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HEATBATH CORPORATION
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A CHEMICAL PROCESS WHICH HELPS IN THE MAINTENANCE OF AXELSON QUALITY

Quality has been an Axelson tradition for fifty years. During that time many new ideas have been developed and put into use in order to assure and maintain quality throughout every Axelson manufacturing step.

One of the many departments installed to make possible the production of better equipment for better service is the "Pentrate" department. This division is devoted entirely to the process involved in giving various metal parts a non-plated, rust resistant black satin-like finish that will stand up against many forms of corrosion.

The Pentrate department is in the capable hands of Joe Palma, whose wide background includes a close association with industrial chemistry for many years.

The Pentrate method of product finishing is a development of the Heatbath Corporation of Springfield, Mass., and constitutes a concentrated processing bath which applies, through chemical action, a penetrating, durable satin-black surface to products made of steel.

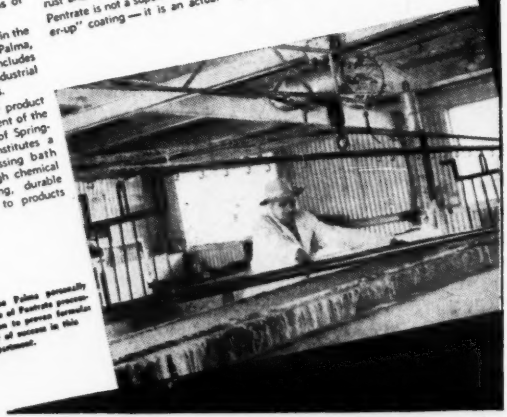
Pentrate is not a plating process, and does not, in itself, create corrosion resistance. Rather, it is a process by which certain chemical salts are caused to penetrate the outer surface of the metal. The rust and corrosion resistant factors are brought about by the fact that oil or other lubricants will adhere far more readily to a Pentrated surface than to a non-processed surface. Once a part has been through the Pentrate process it can be oiled and, when wiped dry (not chemically washed), can be successfully subjected to many of the standard tests for rust and corrosion resistance.

Pentrate is not a superficial "cover-up" coating — it is an actual penetration. Consequently the appearance of a Pentrated surface depends upon the finish of the metal before processing. Spots, flaws, grinding checks, etc., will still show if present on the surface to be processed.

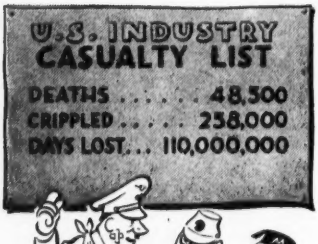
Laboratory tests and the results shown by parts in daily service prove that because of the friction-reducing feature of being more capable of retaining a lubricant, Pentrated surfaces will last longer and give more satisfactory service.

Cutting-tool efficiency has also been greatly increased when the tool is Pentrate-processed because the sleek finish thus provided goes a long toward stepping up the discharge of chips, thereby helping to eliminate "loading" the tool.

Many products formerly finished by such methods as lacquering oxidizing, or saltpeter bluing can be more satisfactorily handled by the Pentrate process. Pentrate, too, looks better, will not chip, peel, crack, or rub off, and in most cases is very inexpensive in its application.



Master Chemist Joe Palma personally watches every phase of Pentrate processing. Strict attention to precise formulas is Joe's secret of success in this department.



Stop- Look- Be Careful

By JEFFREY R. STEWART

Accidents among industrial workers take a high toll in deaths, permanent injuries, and days lost from production. Special attention is paid by the author to prevention of accidents in the finishing field.

IN the interests of industrial safety, a special commission was issued to the National Safety Council to conduct the "Save Manpower for Warpower" campaign. The biggest single job to be accomplished under this program is assistance to industrial employers and employees in cutting down the loss of manpower due to accidents. To date, nearly 2,000 factories are using all or part of the various means developed for conveying the safety message to the workers. These consist of such things as posters, leaflets, cartoons and feature articles, slide films and motion pictures. Today, more than 100,000 posters on the subject of accidents have been posted on plant bulletin boards as a result of the campaign. Also, over 1,000 plant publications are carrying cartoons and educational articles prepared especially for them.

Off-the-Job Accidents More Prevalent than On-the-Job Accidents

Investigation of accidents has shown that 40 per cent of the accidents involving industrial workers happened on the job in the plant, whereas 60 per cent happened off the job in such places as homes, public buildings, streets, highways, and so on. With these accident statistics known, those in charge of war manpower are better equipped to carry out plans for

the conservation of manpower. Also, the War Production Board is in a better position to cooperate with the National Safety Council in their efforts to speed war production.

The big problem, however, is the reduction of the number of accidents when the employees are off the job. Some persons feel that management has no right to control a man's activities after he leaves the plant. Many employees, and a few employers, feel that what a man does on his own time obviously is pretty much his own business, and something for which he has to answer only to his own conscience and the laws of the community. At the same time, most of us realize that an accident suffered off the job keeps a man away from his work just as effectively as an accident suffered on the job. From this standpoint, safety outside the plant as well as inside the plant is important. Practically every employee resents interference in his private life and, therefore, it is easy to realize that this situation must be handled carefully. This is a problem that requires a new, intelligent, tactful and educational program for the managers of industrial companies.

Lost: 270,000,000 Man-Days

Based on the records of previous years, 270,000,000 man-days will be lost during 1943. This figure does not really mean much until it is viewed as enough working time to produce 12,600 large bombers, or 63,000 fighter planes, or 171,000 light tanks, or 324 destroyers, or 39 battleships. All industrial finishing plants, whether they be electroplating organizations, cleaning and polishing shops, or spray shops applying lacquer or enamel to munition parts, now realize that they are up against the most severe labor shortage in the history of the United States. To meet this shortage, industry is displaying good sense by tapping sources of labor untouched heretofore. For instance, we are using older men of almost all previous callings, retired employees, physically handicapped persons, and women workers. It is ridiculous to think that any manufacturer would ignore a program to prevent and reduce accidents, while he is spending so much time in an effort to obtain employees from previously untapped sources.

Static Electricity and the Human Dynamo

Recently a large insurance company retained the writer to solve the mystery of certain accidents which had happened without any apparent cause or reason. The purpose, of course, was to try to prevent these accidents from happening in the future, or at least to try to reduce the number of insurance claims. Of all the accidents which were investigated, the one caused by static electricity was the most baffling and, at the same time, the most interesting. Here is what happened.

A young man had been employed to apply several coats of shellac varnish to the floor of an industrial con-

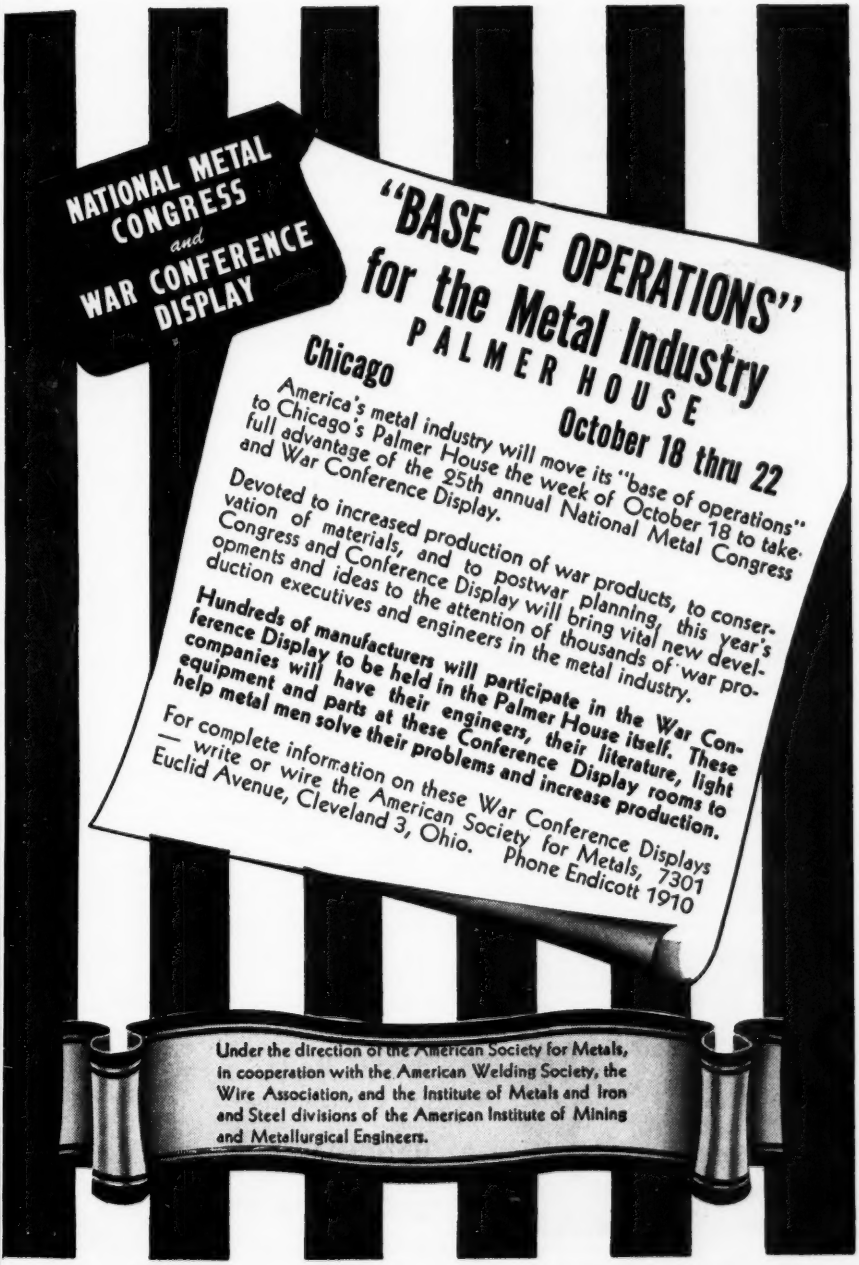
cern. He was called off the varnishing job to do some mechanical type of work in which he was very active and moved around considerably. During this activity, he generated a great deal of static electricity in his body and then returned to the varnishing job. At once he proceeded to withdraw a portion of the shellac varnish from the five-gallon can. The relatively large amount of static electricity that had been generated and stored in his body caused a spark between his fingers and the metal container. According to witnesses, the container first exploded and then burst into flames. When the victim's clothing caught on fire, he proceeded to run down the street instead of rolling on the ground in an attempt to smother the flames. This young man, who could now be helping in the war effort to defeat the Axis, died in the ambulance on the way to the hospital.

The moral of this example is certainly not to put fear or worry into the hearts of all persons working with inflammable materials, such as lacquers, enamels, varnishes, paints, and so on. The essential point, however, is to disclose the fact that any person with a tendency to generate abnormally high amounts of static electricity in his body should either find an occupation in some other industry or take certain precautions in his work. There are certain industrial concerns who already require each prospective employee to take a test for presence of or tendency to generate static electricity. The day is not far off when a much larger percentage of industrial concerns will make this same requirement, especially if the worker is required to come into contact with inflammable or explosive materials.

A scientific instrument known as the "Resistometer" is frequently used in making such tests on individuals. It is an instrument to measure the person's resistance to ground. The resistance is measured and indicated on a meter calibrated in two zones—safe and unsafe. For more definite numerical recordings, the instrument is also calibrated in ohms from zero to 20 million. The test is very rapid and simple, since all the person has to do is to stand on two specially designed metal plates and the resistance can be read directly on the dial.

Although a relatively small number of accidents are caused by static electricity, it is nevertheless a study that should not be ignored. Of all the causes of accidents, fire and explosions, static electricity is one that is particularly baffling, probably because it is one of those intangibles that few understand thoroughly.

During the installation of machinery and equipment in a factory, it can usually be assumed that the engineers and mechanics grounded any of the devices which are continually in motion. However, a check-up every six months is desirable to make sure that the connections have not worked loose nor become worn. This is an added precaution, even though the insurance inspector and the fire marshal in-


NATIONAL METAL CONGRESS
and
WAR CONFERENCE DISPLAY
"BASE OF OPERATIONS" for the Metal Industry
PALMER HOUSE
Chicago
October 18 thru 22
America's metal industry will move its "base of operations" to Chicago's Palmer House the week of October 18 to take full advantage of the 25th annual National Metal Congress and War Conference Display.
Devoted to increased production of war products, to conservation of materials, and to postwar planning, this year's Congress and Conference Display will bring vital new developments and ideas to the attention of thousands of war production executives and engineers in the metal industry.
Hundreds of manufacturers will participate in the War Conference Display to be held in the Palmer House itself. These companies will have their engineers, their literature, light equipment and parts at these Conference Display rooms to help metal men solve their problems and increase production.
For complete information on these War Conference Displays — write or wire the American Society for Metals, 7301 Euclid Avenue, Cleveland 3, Ohio. Phone Endicott 1910
Under the direction of the American Society for Metals, in cooperation with the American Welding Society, the Wire Association, and the Institute of Metals and Iron and Steel divisions of the American Institute of Mining and Metallurgical Engineers.

spect the equipment periodically.

Avoid Sparks Caused by Friction

Generally speaking, we can say that it is reasonably safe to open a can of paint or varnish with a screw driver or putty knife, because, even if a spark were caused by the friction, the flash point of the material would not

be sufficiently low to cause an explosion or fire. However, this cannot be said of lacquers which usually have a much lower flash point than paints and varnishes. Special tools are available for opening such cans, but, if these are not available, it is suggested that a piece of strong fabric such as canvas, felt or even leather be used to cover the end of the can-opening tool. This will prevent a frictional spark, and eliminate a possible explosion or fire.

Explosions Traced to Peculiar Chemical Reactions

Fire or explosion often results from handling materials which are so new to industry that their special hazards are not widely understood. Take, for instance, the case of a helper working in an aircraft factory. He picked up an empty container, opened the valve below a large tank of thinner for use in thinning lacquer in the spray shop, and . . . BANG! . . . the bucket blew up in his face. This man was of average intelligence. He knew that it is foolhardy to hunt for a leak in the gas main with a match. He also knew better than to try to revive a dying fire by pouring gasoline, turpentine or kerosene on it. However, he could not be blamed, even in part, for this accident because he was not violating any safety rule that he had heard about.

No one who was immediately available could imagine what had caused the explosion. The chemist was called in from the nearby laboratory and it was found that the container had previously contained some chromic acid compound which had dried in the form of a residue. This explained everything, because the chemist knew that dry chromic acid and acetone (the latter being one of the ingredients of

Plating LEAD?

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THE HARSHAW CHEMICAL CO.
CLEVELAND, OHIO AND PRINCIPAL CITIES

Your Bond Selling Responsibilities Double!

September 9th, your Government starts the greatest drive in history—the 3rd War Loan! The money to finance the invasion must come in large part from individuals on payrolls.

Here's where YOUR bond selling responsibilities DOUBLE! For this extra money must be raised *in addition* to keeping the established Pay Roll Allotment Plan steadily climbing.

Your now *doubled duties* call for these two steps:

1. Check up on your Pay Roll Plan at once. *Keep it climbing!* Increased Pay Roll percentages mean sufficient post-war purchasing power to keep the Nation's plants (*and yours*) busy.

2. Be a salesman in the 3rd War Loan, to see that every individual on the Pay Roll Plan puts an *extra two weeks salary* into War Bonds—over and above his regular allotment. These *extra* bonds cut the inflationary gap.

Financing this war is a big job—but 130,000,000 Americans are going to see it through 100%. Every citizen should turn every available dollar into the best investment in the world—United States War Bonds.

★ ★ ★

BACK THE ATTACK With War Bonds!

This space is a contribution to victory today and sound business tomorrow by Products Finishing

the lacquer thinner) form an explosive mixture which, although not nearly as dangerous as TNT, is almost certain to "take off." Today in most of the modern plants where chromic acid and other highly oxidizing agents are used to treat metals, the containers are identified by brightly colored paints so that they will be used only for a specific purpose and not interchanged with others.

In the product finishing industry, certain processes and operations are prevalent which develop special hazards peculiar to this industry alone. For this reason, certain research activities are necessary to discover the destructive possibilities before disaster overtakes the plant. It is important to take these steps at the beginning of the new operation or use of new material, and not after its use or consumption has been initiated.

First Aid Station Useful Only After Accidents

We have tried to impress upon the worker how to prevent accidents; however, it is also important to know what to do when an accident does happen. The present war emergency has made us all more conscious and educated in first aid work. One of the best first aid units that has been noted by the writer was devised and assembled by the Air Raid Precaution Division of the Office of Civilian Defense, Baltimore, Maryland. Detailed information regarding first aid training can be obtained from the numerous publications issued by the Office of Civilian Defense, the American Red Cross, the National Safety Council, and many other organizations.

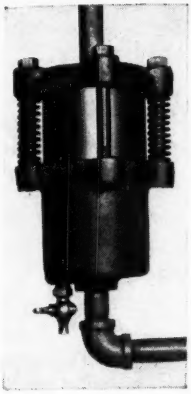
Wanted: Rare Chemicals

THE National Registry of Rare Chemicals, Armour Research Foundation, 33rd, Federal and Dearborn Sts., Chicago, Ill., a non-profit organization operated solely for the interest of the scientific profession, is attempting to locate sources for the chemicals listed below.

1. Pure Estriol (Theeol 500 mg.)
2. Pure Indene (500 g.)
3. Phlorhidzin (Phlorizin)
4. Parinoic Acid
5. Biallyl (1,5 Hexadiene)
6. Deca Tetra Enoic Acid
7. Octa Trienoic Acid
8. 1-3 Pentadiene
9. Ethyl Allene
10. Dextro-Malic Acid
11. Dextro-Mandelic Acid
12. Laevo-Mandelic Acid
13. Copper Selenite Dihydrate
14. Titanium Oxy Sulphate

Anyone who has information regarding possible sources of supply for any of the chemicals in the list is asked to get in touch with Dr. Martin H. Heeren, Director of the Registry.

AVOID WASTE and SPEED UP PRODUCTION



UNIVERSAL AIR FILTERS—for compressed air lines—have proved their superiority over the years in the removal of condensed moisture, oil and other impurities. Using a synthetic porous stone as the filter medium (in addition to the well-known principle of centrifugal action), this filter delivers pure, dry air for process use by the leading Industrials of the U. S. A.

Maintenance is simple and easy. Two filter stones are furnished with each unit to assure continued operation during simple cleaning process.

Detailed information will be gladly supplied on request.

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SODIUM METASILICATE
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*Sodium metasilicate (U. S. Pat. 1898707) insures cleaning baths of high conductivity and stability under high current density. At the same time the soluble silica content aids thorough cleaning and prevents dirt redeposition. Further details on request.

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The History of Electroplating

By BRYANT W. POCOCK

Part 5—The Beginnings of Electroplating

VOLTA 1800

IT has been stated that the perfection of the voltaic pile in 1800 opened the way for a source of electric current, the strength of which could be controlled. This was the first time that man had available a moderately satisfactory, constant electromotive force with which he could conduct experiments leading eventually to the discovery of electrolytic deposition of metals.

CRUIKSHANK

The Englishman Cruikshank, however, dissatisfied with the limitations of Volta's pile and with its various defects, devised a more portable generator of electricity, which he called a trough battery. This was contained in a wooden box, with plates of copper and zinc soldered together and immersed in "acidulated water."

WOLLASTON 1801

It was in 1801 that Wollaston made his famous observation that silver connected with a "more positive" metal such as zinc became coated with copper if put into a solution containing copper. The modern laboratory practice of electrolytic analysis, in which the percentage of a certain metal in an alloy is estimated by plating the metal out on a tared platinum cathode, was predicted as early as 1803 by Cruikshank as a result of his investigations of the galvanic behavior of silver, copper and lead salts in solution.

BRUGNATELLI 1805

In 1805, Brugnatelli connected two silver medals by copper wire with the negative terminal of an electric battery and dipped them into a solution of "fulminating" gold and potassium cyanide, in which was suspended a wire from the positive terminal. He observed that the silver medals became plated with gold, or gilded.

It was indeed a remarkable example of human ingeniousness that only seven years after the appearance of the

[9]Langbein, George, "A Complete Treatise on the Electro-Deposition of Metals," pp. xxviii + 430 + 6 + 32, Henry Carey Baird & Co., Philadelphia, 1894.

DAVY

first electric battery, Sir Humphry Davy was able to discover the elements sodium and potassium by the decomposition of their hydroxides by electric current. It was not, however, until 1820 that Oersted, noting that a freely suspended magnetic needle is deflected by an electric current, was able to construct the first galvanometer actuated by this principle.

OERSTED
1820

OHM
1827

Seven years later Ohm announced his fundamental law that the strength of a continuous current is directly proportional to the E. M. F. and inversely proportional to the resistance ($I = \frac{E}{R}$).

FARADAY
1831

In 1831 Michael Faraday discovered the principle of electric induction; that is, a current may be set up in a closed circuit by any change in the status of another near-by current. The next year the Parisian Pixii devised and constructed an induction machine for generating an electric current on the basis of Faraday's discovery. From now on discoveries and their applications occurred with remarkable frequency.

PIXII
1832

FARADAY
1833

The ability to produce and use electric current for the investigation of natural phenomena had developed to such an extent by 1833 that Faraday was able to show conclusively that the quantities of metals reduced from chemical combination by the effects of a current passing through their solutions are proportional to their chemical equivalents and to the strength of the current. And this, it is to be emphasized, was only 33 years after Volta's invention.

JACOBY
1838
SPENCER
JORDAN
1839

The art and science of galvanoplasty, the reproduction of the shapes of objects by the electrodeposition of metals, was discovered and announced to the Academy of Sciences of St. Petersburg in the spring of 1838 by Professor Jacoby. Mr. T. Spencer and Mr. C. J. Jordan the following year put in their claims for priority in the discovery, and there ensued a considerable amount of legal controversy, the details of which are beyond the scope of this report.

MURRAY
1840

In 1840, Murray was able to make non-metallic surfaces conductive by coating them with graphite. Three years later, Dr. Montgomery introduced gutta-percha as a material suitable for making "negatives" of original models to be reproduced by galvanoplasty.

MONTGOMERY
1843

SCHEELE

WRIGHT

It was Scheele's observation of the solubilities of gold and silver cyanides in a solution of potassium cyanide which led Wright, a former associate of the Elkingtons, to attempt the electrodeposition of these metals from cyanide baths. Wright found that he had opened the way for silver and gold plating of any desired thickness.

BOETTGER
1842

In 1842, Professor Boettger introduced his celebrated double salt, nickel and ammonium sulfate, for the deposition of nickel, which resulted in vastly improved, dense

and lustrous coatings of this metal. The original patent for nickel plating had been granted two years previously, calling for deposition from nickel nitrate solution; but this, of course, was immediately forgotten after the introduction of Boettger's salt.

DE RUOLZ 1842

It is not, apparently, a matter of common knowledge that the first successful deposition of an alloy occurred in 1842, over a hundred years ago, when De Ruolz deposited brass electrolytically from solutions of the mixed salts of the metals comprising the brass.

From 1843 until the relatively recent developments of the past two decades, progress in the field of electroplating consisted mainly of the fabrication of larger and more efficient machines for producing suitable current, and of improvements in plant lay-out and design. The fundamental discoveries had been made, and man set about using them. Of course, other fundamental discoveries remained, but the frequency with which they were made at no time henceforth approached man's ingenuity in designing better and better professional and industrial applications.

WOOLRYCH 1844

The first practical magnetic machine for producing a "permanent" current of electricity from steel magnets was constructed in 1844 by Woolrych and used by Prime & Son in Birmingham, England, in their silverware works. This machine is still preserved in its original position; it stands five feet high and looks like an enormous static machine.

PACINOTTI 1860

The Pacinotti ring was invented in 1860 by Dr. Antonia Pacinotti, of Pisa, Italy, and became incorporated into the design of most electric machines constructed since, with numerous modifications.

"Fire and How to Fight It." A departure in company-sponsored publications is the basic fire-fighting booklet issued by Walter Kidde & Company, Inc., entitled "Fire and How to Fight it." The 36-page illustrated manual is an answer to the demand for a file-size brochure to serve as an easy reference on the subject of first-aid fire-fighting. In simple, graphic terms it describes and illustrates the fundamental facts about fires and their control — what makes them burn, the different types of fires, and the proper handling of each. All the usual varieties of extinguishers, whether of Kidde or competing makes, are covered — soda-acid, water, foam, vaporizing liquid, dry compound, and carbone dioxide—and brief but explicit directions given for their use and maintenance.

The latter part of the booklet is devoted to the more extensive Kidde built-in carbon dioxide extinguishing systems, including total-flooding of a given space; local application to particular hazards; multiple protection of more than one fire hazard by a single battery of cylinders through directional valves; protection of rotating electrical machinery; control of fire at sea in ships, and in airplanes. The book closes with descriptions of the Kidde three types of mobile extinguishing units—the wheeled extinguishers, trailer units, and finally the emergency truck for fast fire-fighting and rescue work, which has become a standard accessory for many commercial and military airfields.

A copy of "Fire and How to Fight It" will be sent free on request to Walter Kidde & Company, Inc., 745 Main St., Belleville, New Jersey.

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The new Burr-Master Tumbling Barrel was originated by Globe to provide a more rapid means of cleaning and deburring today's tougher metal parts. The exclusive high, narrow construction of the barrel confines the work to a smaller area thereby achieving maximum pressure.

The barrel itself is a two-piece, welded steel jacket lined with tough, seasoned maple that cushions the parts against nicking. The inner linings are easily and quickly replaced. The Burr-Master comes in two sizes. The Standard (illustrated) and the Senior. The Standard is equipped with a low-speed, gear-head motor and is the tilting type for easy loading and unloading. The Senior is a double compartment, horizontal type with water-tight shells. The Senior is recommended where large quantities of parts are to be deburred.

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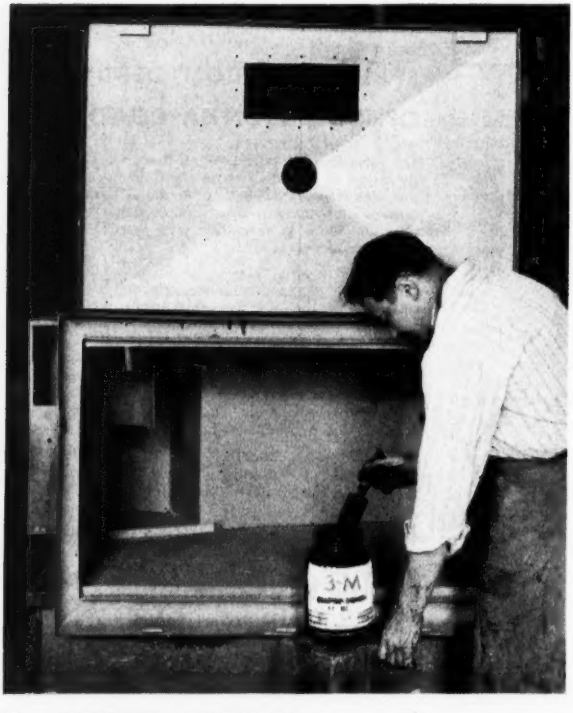
CLEVELAND 2, OHIO

Coating Materials Protect Metal Surfaces

By L. F. SVOBODA
Adhesive Sales, Minnesota Mining & Manufacturing Co.

A GREAT deal is heard these days about synthetic rubber. Comments range from the very optimistic outlook that there will soon be an unlimited supply of ersatz tires, to the pessimistic view that synthetic rubber production is still in its infancy and it will be years before satisfactory production is reached. In general, the view is taken that synthetic rubber is a miraculous new development. Miraculous, it may be; new, definitely not. Of the tried and proven synthetics, Neoprene is probably one of the best known and most widely used.



Application of the primer to a pickling tank.

A frequent error is to consider Neoprene and other synthetic rubbers as substitutes for crude rubber. This is not exactly the case. Neoprene is a compound having the characteristics of rubber, but—in addition—certain specific characteristics that fit it for use where rubber would be valueless. The corrosive action on metal by acids and alkalies is well known and the penetrating or creeping effect of oil

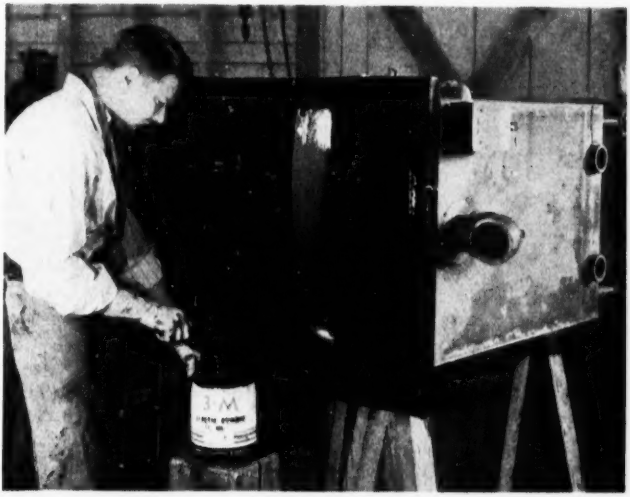
has defied gasket makers for many years. Leather and cork gaskets have been used with fair success, but because of their permeability and perishability they have not been the final answer to the problem. Rubber, an ideal gasket material, swells or is soluble in oil. Synthetic rubber, when used either as a gasket or as a gasket coating compound, provides the best characteristics of rubber plus extreme resistance.

Probably the most significant use for Neoprene as a protective coating compound is in those industries where metal surfaces are to be subjected to strong alkaline or acid solutions and vapors, petroleum solvents, or where a positive sealant is required.

Pure gum rubber in the form of latex has been used with excellent success in many solutions, such as protective coatings for plating tanks; however, Neoprene is said to have proved more resistant to a wider range of solutions. It may be used in pickling tanks, blower fans (for venting acid fumes and vapors) which need protection to prevent extreme corrosion of the fan blades, and to protect aluminum anode clips in alkaline solutions against severe attack.

Neoprene protective compounds are resistant to saturated salt solutions, almost all alkaline solutions of any strength, 50 per cent sulphuric acid at temperatures at 150 to 220 degrees F., and concentrated hydrochloric acid at temperatures up to 230 degrees F. They also have good resistance to acetone, alcohol, all alkalies, carbon dioxides, chlorines, formaldehyde, glycerin, lard, lubricating oils, olive oils, palm oils, organic and inorganic salts, sulphuric-dioxide, water hydrobromic acid, hydrochloric acid, hydrofluoric acid, oleic acid, phosphoris acid, sulphur acid, tartaric acid.

Resistance is fair in the case of acetic acid, cresylic acid, formic acid, ethyl-acetate and other ethers, either, saturated gasoline, kerosone, methyl ethyl ketone, (cold) cotton seed oil, and Crisco.

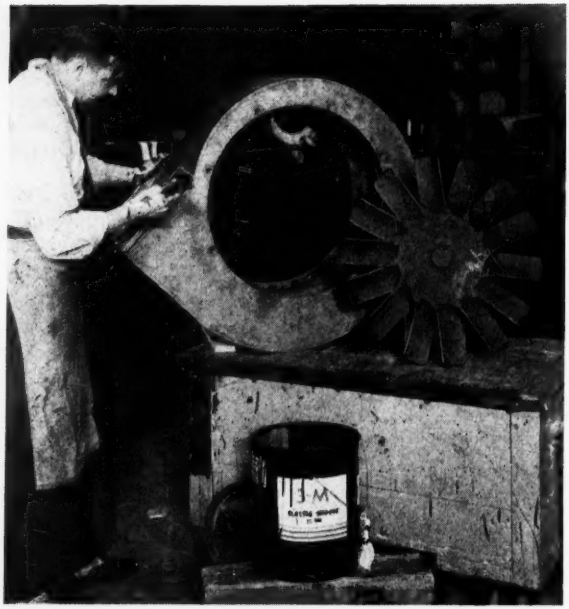


The workman is appling the brushing compound to a pickling tank; the troweling compound has already been applied to the seams and rivet heads.

These protective compounds are usually supplied in a definite combination proved by experience to be most practical for the majority of uses. Such a combination is as follows:

1. Priming cement to be first applied to the thoroughly cleaned metal, wood, concrete, or other surfaces.

2. Tie cement to form an intermediate bond between the primer and the protective coating compound, ap-



A primed blower unit receives a coating of brushing compound.

plied no sooner than 15 minutes after the prime coat.

3. (a) Neoprene brushing compound applied no sooner than 15 minutes after the tie coat, and at least 30 minutes between coats or after troweling compound.

(b) 3M Neoprene troweling compound applied no sooner than 15 minutes after the tie coat and at least 30 minutes between coats.

In most cases the brushing compound is used to give the final protective coat. This may, as the name implies, be applied by means of an ordinary paint brush, preferably not an expensive one but a cheap, rather stiff-bristled brush. The troweling compound is used for filling in pronounced depressions and sealing seams, cracks, and rivet heads. In cases where a very heavy coating is desired, the troweling compound may be applied by means of a regular plasterer's trowel, evening up the final surface with an application of brushing compound.

Both the brushing and troweling compounds require the use of an accelerator which is automatically included in every shipment at no additional cost. This accelerator should be mixed in the proportion of five parts of accelerator to 100 parts of protective coating compound. Mixing should be accomplished just before using, hence curing action starts to take place immediately, rendering the material unfit for use in a comparatively short time. This curing action is similar to the vulcanization of rubber which means that the finished film will be similar to a cured rubber film. The films may be cured by heat or permitted to cure at room temperature. This latter procedure is rather long, taking four to six weeks to effect a complete cure. The most practical cure has been found to be 24 hours at 180 degrees F., followed by six hours at 212 degrees F. Such curing may be accomplished by the use of a hot air jet or, in the case of a tank, filling the tank with hot water.

Solutions of Neoprene contain inflammable coal tar solvents. Thus application of such compounds should not be made near an open flame or electrical equipment that is not spark-proof. Adequate ventilation should be provided to prevent concentration of the fumes. The compound should never be used in confined or partially enclosed areas without an organic vapor gas mask.

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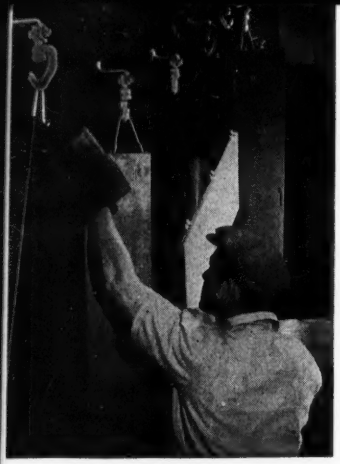


News OF THE INDUSTRY

Sturgis Distributors

The Sturgis Products Company, Sturgis, Mich., manufacturers of Roto-Finish and other mechanical finishing supplies and equipment, announces the appointment of the following distributors for their products:

Wagner Brothers, Detroit, Mich.; Frederic B. Stevens, Inc., Detroit, Mich.; Crown Rheostat & Supply Co., Chicago, Ill.; George A. Stutz Mfg. Co., Chicago, Ill.; Lasalco, Inc., St. Louis, Mo.; Sommers Bros., St. Louis, Mo.; Munning & Munning, Newark, N. J.; MacDermid, Inc., Waterbury, Conn.; W. D. Forbes Co., Minneapolis, Minn.; The Reynolds-Robson Supply Co., Frankford, Philadelphia, Pa., and W. M. Fotheringham, Buffalo, New York.

Peters-Dalton, Inc.

Industrial Equipment Corporation, 628 E. Forest Ave., Detroit 1, Mich., has announced that its name has been changed to Peters-Dalton, Inc., a combination of the names of the company founders—O. A. Peters and A. J. Dalton. The change was made in order to avoid confusion with other firms which have names similar to the former Industrial Equipment Corporation.

Changes in Norton Staff

G. W. Thomson has been appointed abrasive engineer for Norton Company, Worcester, Mass., for the territory which includes the states of Oklahoma Arkansas, western Tennessee and the northern parts of Texas, Louisiana and Mississippi. Henry L. LeMay of the sales engineering department at Worcester will take over Mr. Thomson's former territory in northern Illinois.

J. P. Landers, who has been located in the research laboratories and in the sales engineering department at Worcester, is now doing field engineering work in New York and New Jersey. He will operate under the direction of the Norton Company Philadelphia organization.

DeVilbiss Wartime Course for Spray Painters

Aiming to help industry speed the production of vital war material through faster, more efficient product finishing, The DeVilbiss Company announces that one-week sessions will be conducted especially for industrial spray painting operators as part of the schedule in the second half of its 1943 training school. Open without charge to all applicants using DeVilbiss spray painting equipment in their work, two sessions of the course have already been held in Toledo; additional courses will start on October 18 and November 15.

The course covers all phases of spray painting in application to industrial finishing, with classroom instruction and shop work conducted by spray painting experts. Companies and individuals may obtain additional information and make reservations by writing to The DeVilbiss Company, Toledo 1, Ohio.

New York Meeting of the Electrochemical Society

An interesting educational program has been arranged for the semi-annual fall meeting of the Electrochemical Society, which will be held in New York City, October 13-16, 1943. Dr. L. T. Work, chairman of the local committee for the convention, has announced the following members of his committee: W. C. Moore, vice chairman; L. C. Judson, finance; J. A. Lee, dinners, and W. W. Winship, reception-registration.

Interchemical Moves to Empire State Building

Interchemical Corporation and the administrative offices of several operating divisions and subsidiaries moved to the 16th floor of the Empire State Building, New York City, on August 1. The offices were formerly located at 75 Varick St.

Interchemical Corporation and its operating divisions and subsidiaries manufacture chemical coatings for protection, decoration, and utility—printing, gravure and lithographic inks, industrial finishes, paints, lacquers, enamels, textile colors and allied products.

The new location will house the administrative offices of Interchemical Corporation, International Printing Ink Division, In-Tag Division, Ault & Wiborg Corporation and the Export Division.

Changes in Penn Salt Personnel

Y. F. Hardcastle, vice president in charge of manufacturing of the Pennsylvania Salt Manufacturing Company, Philadelphia, Pa., announces the reorganization of his central office manufacturing and enginering staffs due to the expansion of manufacturing activities. Walker Penfield, formerly manager of engineering, has been appointed works manager and will be in charge of all the manufacturing activities of the company and all of its subsidaries except the Pennsylvania Salt Manufacturing Company of Washington. William F. Mitchell, formerly assistant to Mr. Penfield, continues in that capacity with the title of assistant to the works manager.

Floyd H. Walker, formerly chief engineer of Swenson Division of the Whiting Corporation, is appointed chief engineer and will be in charge of the central engineering division. He will have charge of new constrtuction and assist the manufacturing and other departments in engineering matters. A. E. Gaydos, formerly in charge of the central engineering division under Mr. Penfield, has been named assistant to the vice president in charge of manufacturing, assigned to special duties.

Vincent K. O'Connor, formerly with the Tacoma, Washington office, has been appointed manager of the newly-created personnel department in charge of the handling of all personnel matters and labor relations. Russell E. Cushing continues at Wyandotte as director of chemical engineering department, reporting to Mr. Penfield.

New Representative for Empire Solvents

In the interest of extending better service and for the purpose of establishing resident contacts with important metal centers, Mr. H. Rudner, president of Empire Solvents Corporation, 170 Broadway, New York, N. Y., announces the appointment of the Edward F. Berry Company, 6432 Cass Ave., Detroit, Mich., as representative for Michigan. Mr. Edward F. Berry, head of the representing branch, will be in charge of sales and service for Empire Black, a black oxide finish for steel.

Allan Seymour of Norton Dies

Allan Seymour, Philadelphia district manager for the Abrasive Division of Norton Company, Worcester, Mass., died July 30. He had been with Norton Company for 25 years and in charge of the Philadelphia branch since December, 1934. Previously, he was manager of the Hartford district and head of the sales engineering department at Worcester.

Hathaway Joins Packer Machine Co.

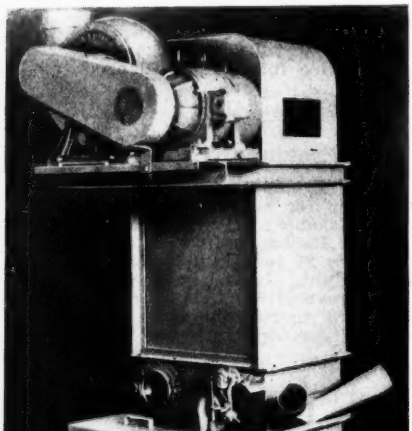
R. H. Hathaway, formerly assistant chief engineer for Hammond Machinery Builders, has joined the Packer Machine Co., Meriden, Conn., as sales and service engineer. Mr. Hathaway has devoted several years to the development, research and application of special, semi and full automatic polishing, deburring and buffing machinery, which is playing an important part in vital defense industries.

New PLANT EQUIPMENT AND Materials

Peters-Dalton Orifice-Type Dust Collector

A small sized unit has been added to the line of orifice-type dust collectors developed by Peters-Dalton, Inc., (formerly Industrial Equipment Corporation), 630 E. Forest Ave., Detroit, Mich. The unit has a capacity of 1200 c.f.m. and has been designed especially to meet the requirements of double spindle grinding and buffing lathes, although it is adaptable to many other kinds of work.

The collector is said to be particularly effective in work with magnesium. The cleaning action is caused by the scientifically directed movement of air through an orifice. A compartment at the side collects the sludge and permits its easy removal. The water level is controlled by a specially constructed diaphram valve.



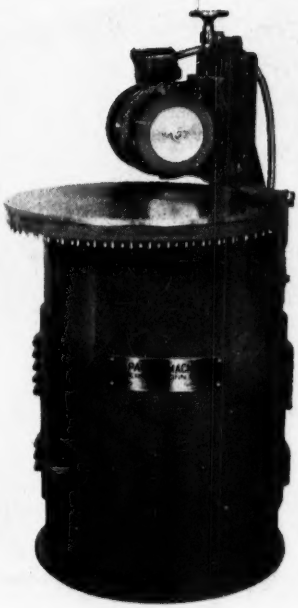
Peters-Dalton Orifice-Type Dust Collector

Packer-Matic No. 7

A continuous rotary grinding, deburring, polishing or buffing machine—the Packer-Matic No. 7—which is used primarily for deburring operations on studs, screws and various special shapes, has been announced by The Packer Machine Company, Meriden, Conn. The machine is of rugged and compact construction with built-in flexibility for a wide range of sizes. A second head or wheel can be attached for producing multiple operations.

The table, on which are mounted fixtures or holding devices, runs on a ball-bearing spindle properly designed and constructed, not only for long life but also for ease and accessibility in making changes. Attachments are provided for automatic discharge of work being finished and hopper feeds can be used wherever practical.

The pedestal or base is fully enclosed



Packer-Matic No. 7

and includes a dust-tight cabinet as an integral part for all electrical controls. Wheels may be either mounted in vertical or horizontal positions as required. Specifications for the machine are as follows: diameter of table, 25½ in.; height of table from floor, 36 in.; floor space required, 28 x 47 in.; main drive motor, ½ h.p.; motor for driving wheels, 1 h.p. or larger as required.

Empire Black

A one-bath, low temperature black oxide finish for steel, to be known as "Empire Black," has been developed by Empire Solvents Corp., 170 Broadway, New York 7, N. Y. The Empire Black process operates at temperatures as low as 260 deg. F., the boiling point of the salts making the process easy and safe to handle.

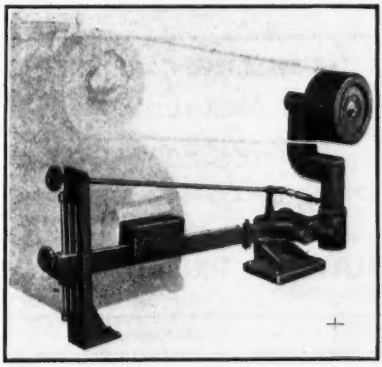
Because of the low operating temperature, the process requires a concentration of only six and one-half pounds of salts to each gallon of water. The possibility of a smut (carbon rust) is said to be eliminated. Empire Black is reported to be particularly effective on parts which have been heat treated.

It is claimed that only one bath is required to get uniform results, thus saving chemicals, time and labor. Empire Black achieves an unbroken, uniform penetration of from 0.00035 to 0.00045 in., depending on the particular steel surface being treated. Parts treated with Empire Black are said to exhibit increased resistance to rust and other corrosion. Empire Black forms a blue-black finish that will not chip, crack, peel, craze or rub off, and makes an ideal surface on which to apply decorative or protective coats of paint or lacquer.

DBX Abrasive Belt Backstand

The principle of front control for adjusting belt tension and tracking alignment is stressed in the design of the DBX Abrasive Belt Backstand which has been developed by Divine Brothers Company, Utica 1, N. Y. It is claimed that the backstand will convert almost any type of lathe for abrasive belt work.

The DBX backstand is a heavy, durable piece of equipment which can be furnished in either right or left hand models. All moving parts are accurately machined to assure alignment, ease of adjustment and a minimum of vibration. The belt can be changed quickly by releasing a friction lock and raising the counterweight arm. Hoods of sheet steel



DBX Abrasive Belt Backstand

to enclose the backstand completely are available; also hoods with built-in platen for flat sanding work.

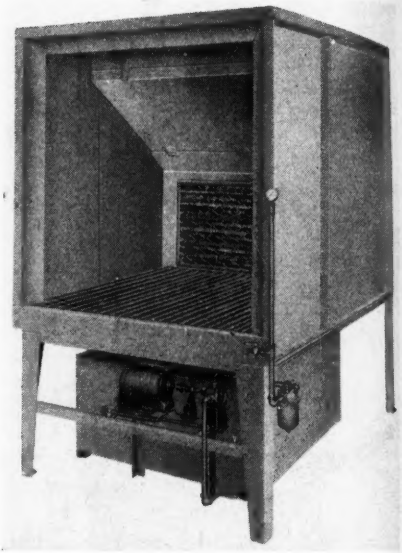
Tri-Mur-Lite C-1

Murphy Chemical Corporation, 480 Lexington Ave., New York, N. Y., has announced the development of Tri-Mur-Lite C-1, a non-toxic, odorless, neutral, water-soluble degreasing fluid which speeds up the cleaning of shells. It is claimed that Tri-Mur-Lite C-1 will dissolve oil, grease and dirt from all types of metals, machinery or other surfaces, converting the oil and grease into a thin soluble film. The low viscosity of Tri-Mur-Lite C-1 makes it especially penetrating; the resulting film can easily be washed from the surface. Tri-Mur-Lite C-1 may be used in spraying, dipping or hand wiping methods.

DeVilbiss Spray-Degreasing Booth

A spray-degreasing booth announced by The DeVilbiss Company, Toledo, Ohio, is reported to combine those features which have proved themselves most desirable in hundreds of units built by this manufacturer for industry and the armed services.

In view of the war-born shortage of organic solvents of the type used in degreasing operations, one of the most important of the advantages claimed for this spray-degreasing booth is the ability to hold solvent loss to barest minimum. Engineered for safe operation, even when hazardous materials of high volatility and very low flash-point



DeVilbiss Spray-Degreasing Booth

are used, the unit removes fumes thoroughly and delivers a forceful, hard-driving solvent spray. The booth is made in 14, 16 and 18-gauge steel. Sizes vary according to the requirements of the products to be handled.

AFTER SELECTIVE CARBURIZING
McKeon's
"Liquid Sulphur"
SPEEDS UP COPPER STRIPPING
Sample FREE
SULPHUR PRODUCTS CO.
GREENSBURG PA.

Roe Portable Polishing Machine

The machine shown in the illustration has been designed by Lewis Roe Mfg. Co., 1050 DeKalb Ave., Brooklyn, N. Y., for light buffing and coloring work. The machine is driven by a ¼ h.p. alternating or direct current driving motor mounted on the stand.

The machine is equipped with two self-aligning ball bearing pillow blocks and has a ¾-in. diameter spindle, 22 in. long. Longer spindles can be furnished if required. The spindles are turned down at the ends to the diame-

For a real good polishing job use
KEYSTONE EMERY
TURKISH — NAXOS — AMERICAN
KEYSTONE EMERY MILLS Write for Sample 4316 Paul St., Phila., Pa.

R-200

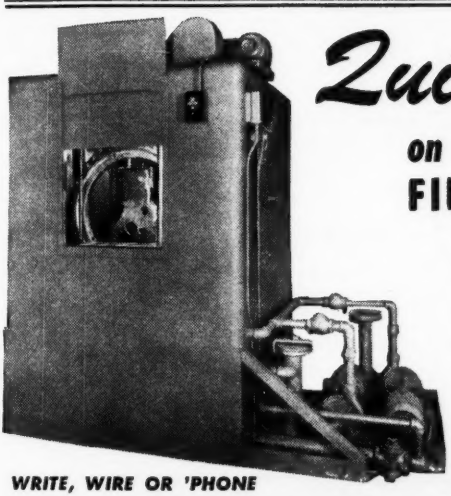
500 LARGE CARTRIDGE CLIPS COATED PER MINUTE
1000 1" BUCKLES COATED PER MINUTE

with R-200

"SPEEDIP" Whirl Enameler and Coating Machine

A combination dipping-whirling machine for completely coating large quantities of small parts with lacquer, enamel, paint, oil, wax, etc. • All operations are within the machine. Parts are dipped into coating material, raised and whirled. Time—as little as 30 seconds. Speeds up production — cuts finishing costs—saves coating materials. • Write for further details or send samples to be coated.

RONCI MACHINE CO.
45 River Ave., Providence, R. I.



WRITE, WIRE OR 'PHONE

Quick Action on METAL CLEANING and FINISHING *Problems*

HOWARD maintains a fully equipped experimental department to solve your cleaning and finishing problems . . . quickly . . . correctly. Send us essential details and a sample of your work, or request our engineer to call. We'll process the parts, recommend proper methods, materials and machinery — NO COST OR OBLIGATION.

The Wash and Rinse Machine shown is a typical result of this service—specially designed and built by HOWARD for a maker of automotive cylinder blocks.

HOWARD ENGINEERING & MFG. CO.
1056 Hulbert Cincinnati 14, Ohio
Metal Cleaning and Finishing Machinery

Roe Portable Polishing Machine

ter of ⅛ in. and threaded eight square threads to the inch. The spindle is tapered for taper points which are furnished with the machine.

A switch, eight ft. of cord, a V-belt and a device for keeping the belt at uniform tension are also furnished. The machine weighs approximately 100 lb. and can be moved about the shop.

Precision Plating Process

A process by which plastics, glass or any non-conductor can be plated with any of the plating metals is announced by Precision Paper Tube Company, Special Products Division, 2023 W. Charleston St., Chicago 47, Ill. Convex and concave surfaces, convolutions, corners and recesses are said to be as thoroughly plated as flat or simple round surfaces. It is claimed that the metal plating is permanent and does not crack, chip nor peel off in long and severe service.

The following advantages are cited by Precision: critical and strategic metals are conserved; production costs are reduced; weight is saved; design can be simplified; dimensional stability is insured; oils, solvents and moisture cannot be obsorbed; electrolytic corrosion between dissimilar metals is eliminated, and heat resistance is increased.

The process can be used for plating magnetic and electric shielding of all kinds—radio shielding, electrostatic and magnetic shielding, applications as coil shields, condensers, and so on. Both rigid and pliable types of plastic tubing and pipe fittings can be plated. The uses of the process are said to extend into all electrical and mechanical manufacture.

Steel Grip "Fingerless" Glove

For many years the steel reinforced gloves, mittens and handguards manufactured by the Industrial Gloves Company, 746 Garfield Blvd., Danville, Ill., have been used in the handling of sheet metal, bars, rods, stampings, castings, and so on. Recently, in view of the great amount of sheet metal stamping and need for speedy handling on production lines, there has been a demand

SOL-KLEAN
for
Better Paint Adhesion
INDUSTRIAL CHEMICAL PRODUCTS CO.
DETROIT 7
Milwaukee **Fort Wayne**

BETTER PLATING, LESS COST!
"MGC" ELECTROPLATING EQUIPMENT
Write for Interesting Details TODAY!
MOTOR GENERATOR CORP., HOBART SQ. BOX #93 TROY, OHIO

37mm SHELLS CLEANED

Faster • Safely • Cheaper

WITH TRI-MUR-LITE C-1

NON-TOXIC • ODORLESS • FOR ALL METALS • NEUTRAL

A soluble degreasing fluid used at room temperature makes quick work of cleaning shells without the "After Rusting" problem. Using TRI-MUR-LITE for this purpose, a large eastern steel plant* made only minor changes in their automatic vapor degreasing machine and claims results never before possible with noxious degreasing fluids.

Dissolves all types of oils, grease, smut, buffing compounds and dirt from all metals, machinery and other surfaces by converting them into a thin soluble film that rinses instantly. Can be used in open dip-tanks (no fumes) or applied by spraying, brushing or hand wiping methods. No interference with subsequent painting or plating operations. No injury to metals, painted surfaces, or to the user.

Available without high priorities—any quantity—Standard 50 Gallon drums. Immediate shipments! Write or wire—

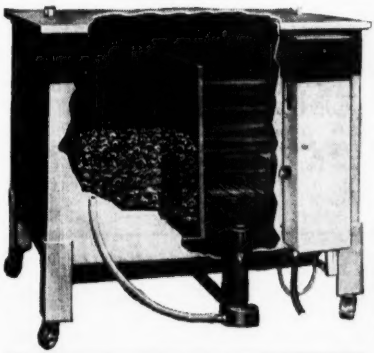
** Name on Request!*

MURPHY CHEMICAL CORPORATION

480 LEXINGTON AVENUE **NEW YORK CITY, N. Y.**

NEW Improved

Vapor Degreasing



Speeds Up Vapor Degreasing by More Than 33⅓% -- Safer, More Economical

Developed by Phillips, PHILLSOLV vapor degreasing solvent is tops for efficiency. It cuts vapor degreasing time by one third! Reduces vapor loss. Handles wider range of greases. Gives more thorough penetration of close, nested parts of ferrous and non-ferrous metals. Low toxicity—higher safety factor.

Complete Line of Electrical
VAPOR DEGREASING MACHINES
A machine for every type of job. Portable—can be moved to the job. Require no gas, water or steam lines. Many other features. Write for catalog.

Write for FREE Degreasing Manual!

PHILLSOLV, non-water soluble, has many applications in instrument and war plants. No corrosive action. Write today for FREE manual on Vapor Degreasing telling how to use this new process. Also for catalog of Phillips Electrical Vapor Degreasing machines.

PHILLIPS Manufacturing Company • 3454 W. Houhy Ave., CHICAGO, ILLINOIS

for a more flexible glove, without sacrifice of safety or wearing service.

To fill this need, the manufacturer has developed the "fingerless" steel reinforced glove No. 14962, shown in the illustration. A sturdy chrome-tanned

Steel Grip "Fingerless" Glove

cowhide glove, with finger and thumb tips removed, is reinforced vertically with steel ribbons, steel stitched. The glove is said to be practically rip-proof. A leather patch adds extra wear and protection on the palm and junction of the palm and thumb. It is claimed that the glove is ideal for use where finger "touch" is necessary and to provide utmost protection for the palm and lower portion of thumb and finger.

Reanite Bonding Process

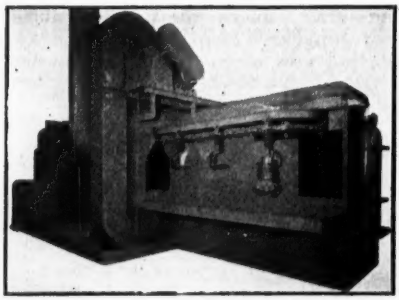
A method of bonding metal to metal, or rubber, synthetic rubber, plastics, leather or wood to metal, or to each other, with a bond in most instances stronger than the materials themselves, has recently been announced by The U. S. Stoneware Co., Akron, Ohio. The process known as the Reanite Bonding Process, develops a bond—metal to metal—which in repeated tests has shown itself to be exceptionally strong.

The Reanite Process is said to be suitable for use with almost all metals —iron, steel, stainless steel, magnesium, aluminum, aluminum alloys, copper, bronze and brass. The application of the process is simple. The surfaces to be joined are brushed, sprayed or dipped with Reanite. After drying, mild heat and pressure is applied. It is claimed that a Reanite joint is unaffected by fresh or salt water, is non-corrosive to metals, possesses excellent corrosion-resistance in itself, and has high dielectric strength.

Present uses of Reanite include fabrication of airplane sub-assemblies, motor mounts, sound and vibration damper assemblies, instrument mounts, composite metallic and plastic units, and so on.

Paasche Type F974 Electrically-Heated Airbrush

An electrically-heated airbrush designated as the Type F974, which heats both the air and the material being sprayed, has been placed on the market by Paasche Airbrush Co., 1910 Diversey Parkway, Chicago, Ill. The Type F974 is said to have distinct advantages over previous models, providing perfect insulation for trigger and handle, better balance for easy operation, and precise control of round and fan spray by



HYDRO-FLOW
INDUSTRIAL WASHING MACHINES

Streamlined design. Recirculating hot or cold air blow off. Hidden motors, pumps and pipes are easily accessible. Piping and nozzles located to insure thorough cleansing of all surfaces. Rugged and efficient pressure pump. Corrosion resistant spray nozzles—from mist to open stream. Handling alkali to varsol as cleaner. Monorail, Belt, or Gravity type conveyors designed to carry any shape or size material. Variable speeds on conveyor drive synchronize production.

INTERNATIONAL CONVEYOR & WASHER CORP.
Write for circular.
540 E. FORT ST. DETROIT, MICH.

COAT METAL, PLASTIC, WOOD OR PAPER WITH . . .

FLOCK

TO OBTAIN A FINISH SIMULATING FABRIC, VELVET, LEATHER, ETC.

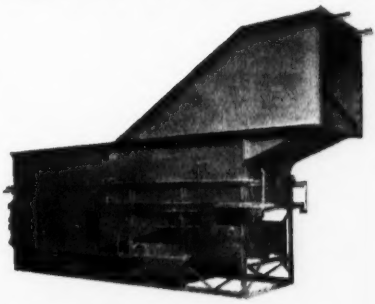
Also for Sound deadening, temperature, insulation, and for soft, non-mar surfaces. Rayco Flock is textile fibres cut to uniform lengths, applied by adhesive to form a solid, even coating. Request color samples and prices.

RAYON PROCESSING CO. of R. I., INC. 65 Tremont Street Central Falls, R. I.

BLAKESLEE DEGREASERS SPEED-UP PRODUCTION

Maintain production and obtain 100% grease-free metal surfaces with Blakeslee Degreasers. Efficient engineering design and construction insures production and *lowest* solvent operating costs.

We would welcome the opportunity of discussing the application of Blakeslee Degreasers or Metal Parts Washers with you and just how your production may be speeded and cleaning costs cut. An engineer will be pleased to call on you without obligation on your part.



G. S. BLAKESLEE & CO.

NEW YORK — CICERO STATION CHICAGO — TORONTO

means of a calibrated dial.

The heat is thermostatically controlled from a low of 180 deg. F. to a medium of 260 deg. F. and a high of 320 deg. F. The airbrush requires only 10 to 30 lb.

Paasche Type F974 Electrically-Heated Airbrush

air pressure for maximum efficiency. It is recommended for the application of such materials as paraffin, heavy oils, glues, resins, greases and waxes. The materials may be applied either wet or dry.

An airconditioner unit to provide clean dry air to the airbrush is also available.

"Ridsmel"

Holley Chemical Co., 125 E. 25th St., New York, N. Y., has developed a liquid paint deodorant, to be known as "Ridsmel." A small amount of Ridsmel may be mixed with any paint, varnish or enamel to eliminate the usual odors completely. It is said to be equally effective with brush or spray operation.

Ridsmel does not affect the color, drying qualities or durability of finishes. One quart of the solution will effectively neutralize 200 gallons of paint, varnish or enamel. When used in maintenance painting, Ridsmel permits normal activities to continue while the premises are being painted.

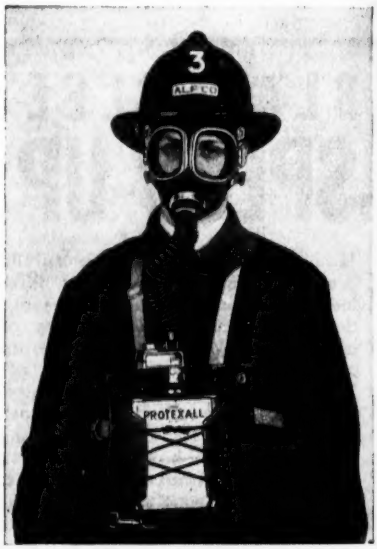
Protexall Gas Mask

A gas mask, designated as the Protexall, is announced by American-La France-Foamite Corporation, Elmira, N. Y. It has the approval of the U. S. Bureau of Mines for respiratory protection against acid gases, organic vapors, ammonia, carbon monoxide and toxic smokes where there is sufficient oxygen present to support life.

The facepiece is of specially molded rubber. It fits any face, and forms a gas-tight seal. Large contoured lenses of shatter-proof safety glass give full-view vision. Dry, incoming air passes over the lenses, and thus prevents fogging. The lenses are detachable. The head harness is comfortable and readily adjusted by swivel buckles.

The exhalation valve is of simple design; there is no seat to corrode or get out of alignment. The valve is protected against injury by a metal guard. The non-collapsible, rugged, yet light and flexible corrugated tube allows free head movement. The timer tells the length of time the mask can be safely used. One revolution of the dial hand means that a new canister is needed. The canister gives approximately two hours' service.

The canister is carefully designed to



Protexall Gas Mask

give a minimum of resistance to breathing. It contains a low resistance filter

LOW COST!
ONE BATH!
SPEEDS UP PRODUCTION
A PERFECTED BLACK OXIDE FINISH FOR STEEL

NO SMUT
USES 1/3 LESS SALTS
RUST-RESISTING
LOW TEMP. 260°F
WIDE OPERATING RANGE TO 300°F
PENETRATES HARDENED STEEL

Empire BLACK

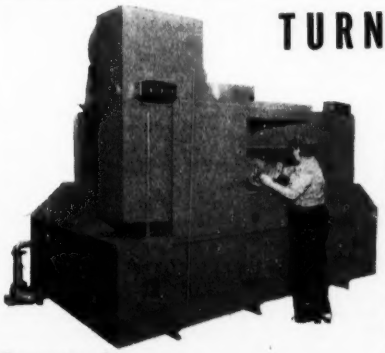
ORDER 100 LB. TEST DRUM AT SPECIAL TON-RATE PRICE 19¢ LB.

EMPIRE SOLVENTS CORP.

170 BROADWAY, NEW YORK 7, N Y
DETROIT: EDW. F. BERRY CO., 6432 CASS AVENUE

TURNTABLE OPERATION

SIMPLIFIES CLEANING OF METAL PARTS



Only one operator is needed to place work on the slowly rotating, large mesh turntable of the Industrial Segmented Cabinet Washing Machine and removes it when finished. This unit is entirely automatic—conveying the work through successive stages of washing, rinsing (or slushing) and drying.

The efficiently engineered features of this machine fully meet the exacting production requirements of leading industrials where installations are in service handling a wide range of metal parts cleaning problems such as engine cylinders, pistons, piston rings, rocker arms, master rods, machined castings, die castings and flexible metal tubing.

Ask us for a solution to your product washing and drying problem. Write, wire or 'phone—today!

Features of
Segmented Cabinet Washing Machine

- Only one operator required—no skill necessary.
- Occupies small floor space—only 10½' x 6½'.
- Develops maximum spray coverage.
- Handles range of work from 1½ to 7½ square feet per hour.
- Any cleaning detergent can be used.

INDUSTRIAL WASHING MACHINE CORPORATION
291 SUMNER ST.
NEW BRUNSWICK, N. J.

for toxic smoke, dust, mists, fumes. Chemicals absorb or make harmless all poisonous gases, toxic smokes or vapors met in modern industry or fire-fighting. The canister is furnished in a strongly constructed metal reinforced fibre case, built to withstand moisture and hard usage. Each mask is supplied with a spare canister.

New Literature

Surface Preparation of Iron and Steel for Zinc and Bright Zinc Plating. Today's widespread use of bright zinc, in place of increasingly scarce cadmium for plating ordnance matériel and other vital war supplies, emphasizes the importance of proper surface preparation before application of protective zinc coatings. To help plating departments and contract finishing shops speed-up this work and minimize or eliminate rejects, a six-page Special Service Report, containing data on successfully used metal degreasing techniques and procedures, has been issued by Oakite Products, Inc.

This report concisely reviews still tank and cathodic cleaning as well as anodic degreasing for removing smut, dirt, grease, quenching oils, cutting oils, drawing and stamping compounds and other accumulations from metal surfaces. In addition, it includes data on pre-soaking techniques, to be used whenever required, that aid in obtaining chemically clean surfaces. Helpful tips and suggestions are also given on the use of pickling treatments and acid baths for removing oxide, scale and rust.

Free copies of the report are available on request from Oakite Products, Inc., 20 Thames St., New York 6, N. Y.

Color Standards. A descriptive bulletin on the Holabird Ordnance Motor Base Specification ES 680-a has been prepared by the Sherwin-Williams Company, 101 Prospect Ave., Cleveland, Ohio. This specification in general covers the finishing of all motorized equipment and rolling stock employed by the U. S. Army. The booklet explains the specification and gives details regarding the various types of S-W finishes which meet its requirements. A color chart is included, which shows samples of surfacers and undercoaters; lustreless quick flash air drying and baking enamels; gloss and semi-gloss air drying enamels, and wrinkle finish baking enamels. Copy of the booklet free upon request.

ROLOCK

PROCESSING CARRIERS

SET NEW STANDARDS IN HANDLING TIME

Built for the specific job, Rolock designed *Baskets, Crates, Racks, Trays, etc.* meet the demands of time and load studies, temperature and acid exposures, or simple efficiency for the duty performed. For instance, the coolant draining basket shown, which fits in a standard pail used to catch screw machine products.

Details on request.

ROLOCK, INC.

1400 Kings Highway East Fairfield Conn

Rotary Finishing Machine. Bulletin No. 401, describing Hammond Rotary Table Automatics, is announced by Hammond Machinery Builders, Inc., 1622 Douglas Ave., Kalamazoo 54F, Michigan. The key to efficient automatic finishing is described in the eight-page illustrated bulletin which shows Hammond high-production six and eight (work-holding) spindle rotary table automatics. Detailed information, shown photographically, gives various combinations of relatively standard units and their extreme flexibility in adjustment of heads, table speeds, and work-holding chucks which make them adaptable to a wide variety of parts to be deburred, brushed, polished or buffed.

Construction features are clearly given and a complete table of specifications is tabulated for ready reference. A copy will be sent, without obligation, on a request written on your business letterhead.

Automatic and Semi-Automatic Plating Equipment Catalog. Just off the press has come the Stevens Automatic and Semi-Automatic Plating Equipment catalog, which is now available from Frederic B. Stevens, Inc., 510 Third St., Detroit 26, Mich. This new edition, comprising 44 pages, illustrates and describes many changes and improvements which have been incorporated in the Stevens line of plating equipment.

The catalog contains much valuable information on plating practices for those in the metal-finishing industry. A copy of this new catalog may be obtained by requesting it in a letter written on your business letterhead.

Opportunity Section

Technical Sales Service Men

—for servicing metal cleaning chemicals to war plants in metal processing industry, chemical or technical background helpful. Salary while training. Write Box 91, PRODUCTS FINISHING, 431 Main St., Cincinnati 2, Ohio.

PRODUCTION MANAGER WANTED

Electroplating jobbing plant. 100% war work. Excellent post war possibilities. Location—Central New Jersey. Capable of taking complete charge. Full knowledge of solutions. Reply in full, stating qualifications, past experience, salary desired. Write Box No. 96, PRODUCTS FINISHING, 431 Main Street, Cincinnati 2, Ohio.

Supervisory Foreman Wanted

For Electro-Plating, Polishing, Painting in a job shop doing war work in Middle West. Give experience, ability and references. Box 94, PRODUCTS FINISHING, 431 Main St., Cincinnati 2, Ohio.

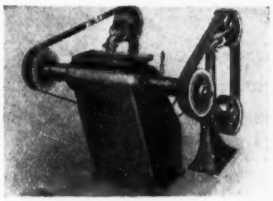
The New

JONES

BACKSTAND IDLER

NO. 120

For Faster Grinding and Polishing



Converts Your Lathe to Fast, Smooth, Even ABRASIVE BELT GRINDING

Ideal for crowded grinding and polishing departments, the Jones Abrasive Belt Backstand Idler No. 120 takes a minimum of floor space to convert your present lathe to fast, uniform, low-cost abrasive belt grinding.

- *Uses Minimum Floor Space*
- *Conveniently Located Controls*
- *High Speed—Fast Production*
- *Easy to set up*

Note the simple arrangement above, using a regular lathe and two Jones Backstands. *Bulletin No. 120* gives complete details.

JONES ENGINEERING COMPANY

DEPT. B-2

ELLWOOD CITY, PENNSYLVANIA

CATALOGS

FOR YOUR LIBRARY

To obtain copies of the catalogs listed here, indicate on the coupon the number of the item in which you are interested and mail as directed.

1. Shell Cleaning with DuBoy Products

A data sheet describing the soaker tank method with Actex 200, the solvent method with Actusol, and the industrial washing machine method with Actex 200 is now being distributed by The DuBois Company, 1120 W. Front St., Cincinnati, Ohio.

2. Speed Production

A booklet containing information about a new technique of grinding, finishing, and polishing that offers increased production to finishing departments is now being issued by Minnesota Mining & Mfg. Co., Forest and Fanquier Sts., St. Paul, Minnesota.

3. Metal Cleaning Equipment

A four-page folder which illustrates and describes a well-rounded line of equipment for cleaning war products such as cartridges, gun barrels, shells and similar products is now being issued by the Alvey-Ferguson Company, 162 Disney St., Cincinnati, Ohio.

4. Rolock Specialized Processing Carriers

In a four-page catalog, Rolock, Inc., 1400 Kings Highway E., Fairfield, Conn., presents its line of industrial baskets, crates, trays, and fixtures.

5. Deoxidizing

The process of Deoxidizing steel artillery shell cases or other steel and aluminum ordnance parts for varnish and paint finishes with Deoxidine No. 170 is the subject of a folder available from American Chemical Paint Company, Ambler, Pennsylvania.

6. Howard Finishing Equipment

A 33-page catalog which describes and illustrates 28 types of widely adaptable product finishing equipment is now being issued by the Howard Engineering & Manufacturing Co., 1056 Hulbert St., Cincinnati, Ohio.

7. Metal Parts Washers

Various models of Detrex Washers are pictured and described in a catalog issued by the Detrex Corporation, 13017 Hillview Ave., Detroit, Michigan.

8. Industrial Fire-Fighting

A manual entitled "How to Teach Fire-Fighting" which tells how to stage a fast-moving, interesting, instructive fire-class can be obtained from Walter Kidde & Company, Inc., 431 West St., Bloomfield, New Jersey.

9. Surface Preparation of Metals

Surface preparation of metals with Oakite materials and methods before black oxide finishing is discussed in 20-page booklet distributed by Oakite Products, Inc., 20 Thames St., New York, N. Y.

10. Lead Plating

Harshaw Chemical Co., 1945 E. 97th St., Cleveland, Ohio, has available a bulletin which describes lead plating with Harshaw fluoborate lead solution concentrate—suggested uses, solution preparation, equipment and procedure.

11. Color Standards

An informative bulletin which describes Sherwin-Williams finishes that meet Holabird Ordnance Motor Base Specification ES-680a is distributed by The Sherwin-Williams Co., Cleveland, Ohio.

12. Penchlor Acid-Proof Cement

An eight-page catalog which thoroughly describes Penchlor Acid-Proof cement is now being issued by the Pennsylvania Salt Manufacturing Co., 1000 Widener Bldg., Philadelphia, Pennsylvania.

13. Data on Production Facilities

The Kirk & Blum Mfg. Co., 2816 Spring Grove Ave., Cincinnati, Ohio, is now issuing a catalog containing an abundance of information on the facilities of this company which are available to those who require sheet metal fabrication.

14. Transparent Stripping Lacquer

The features of Protektol, a transparent stripping lacquer, are outlined in a folder distributed by Ault & Wiborg Corp., Empire State Bldg., New York, New York.

15. Black Oxide Finish

Data on Du-Lite Black Oxide Finish for steel parts is provided in a folder which is available from Du-Lite Chemical Corp., Middletown, Conn. A variety of steel parts, Du-Lite finished, are illustrated.

16. Hard Chromium Plating

A 16-page data bulletin summarizing the applications of industrial chromium plating is now being issued by United Chromium, Inc., 51 East 42nd St., New York City.

17. Abrasive Belt Back Stand Idler

Complete description of the Jones Abrasive Belt Backstand Idler No. 120 is given in a bulletin available from Jones Engineering Company, Ellwood City, Pennsylvania.

18. Pentrate—the Modern Finish for Steel

One of the most beautifully illustrated catalogs issued by the Heatbath Corporation, P. O. Box 78, Springfield, Mass., describes the Pentrate Phytanium Blended finish for steel products of all kinds.

19. Plating Equipment

A new 44-page catalog features Stevens automatic and semi-automatic plating equipment. Frederic B. Stevens, Inc., 510 Third St., Detroit 26, Michigan.

20. Vapor Degreasing

A manual on vapor degreasing which discusses the use of Phillsolv, a non-water soluble, has been prepared by Phillips Manufacturing Company, 3482 W. Touhy Ave., Chicago, Illinois.

21. Turco Specialized Compounds

The part which Turco specialized industrial chemical compounds play in speeding up war production is outlined in a bulletin issued by Turco Products, Inc., 6135 S. Central Ave., Los Angeles, Calif.

22. Heavy-Duty Fans

Complete information on Despatch heavy-duty high-temperature acid-resistant fans is given in Bulletin No. 78 available from Despatch Oven Company, Minneapolis, Minnesota.

Print plainly in filling out coupon for literature.

PRODUCTS FINISHING
431 Main St., Cincinnati (2), Ohio

I am interested in receiving the following literature reviewed in your September issue.

No...... **No.**..... **No.**..... **No.**..... **No.**.....
(Insert numbers denoting literature you want.)

Name ..... Title.....

Company .....

Company Address .....

City .... State.....

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CLEANING
PLATING
POLISHING
FINISHING

SEPTEMBER • • 1943

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Going 6 miles per minute!

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A small, but vitally important item on most combat equipment, is the instrument dial from which split second, accurate readings must be made.

The permanent retention of balanced contrast between small black figures on a non-reflective white background is now possible through the use of Roxalin DIAL WHITE Enamel* which overcomes the weakness of conventional materials formerly used for this purpose.

Roxalin DIAL WHITE will not discolor on aging, is unaffected by sudden temperature changes, and retains its initial clean white tone even after long exposure to chemical fumes frequently encountered in molded plastic housings.

It is easily applied in production by spraying or roller coating, sets up to handle in lacquer time or may be forced dried if desired.

Write for complete information.

***Another coating of plastic by Roxalin.**

ROXALIN *Flexible* FINISHES
INCORPORATED
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BETTER BLACK FINISHES

Assured by Fast, Thorough
OAKITE DEGREASING

ONE of the FIRST STEPS in getting a satisfactory black oxide finish on war supply items . . . is THOROUGH surface degreasing. All smut, oil, grease, scale, rust or other deposits must be removed. The metal surface must be made CHEMICALLY CLEAN!

Provides Results You Want . . . Economical!

You can meet this essential production requirement easily by using specialized Oakite degreasing and descaling materials. Whether applied by tank immersion or automatic washing machine method, these effective, fast-working materials give you the dependable results you want in preparing iron, steel, brass, zinc, copper or aluminum for black oxide finishing . . . help you keep production moving along smoothly according to schedule . . . and do it at low cost!

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If you would like help in preparing gun or airplane parts, automotive parts, instruments, bearings, gears, tools or other war products for black oxide finishing, write today for FREE 20-page manual giving successfully used methods and formulae.

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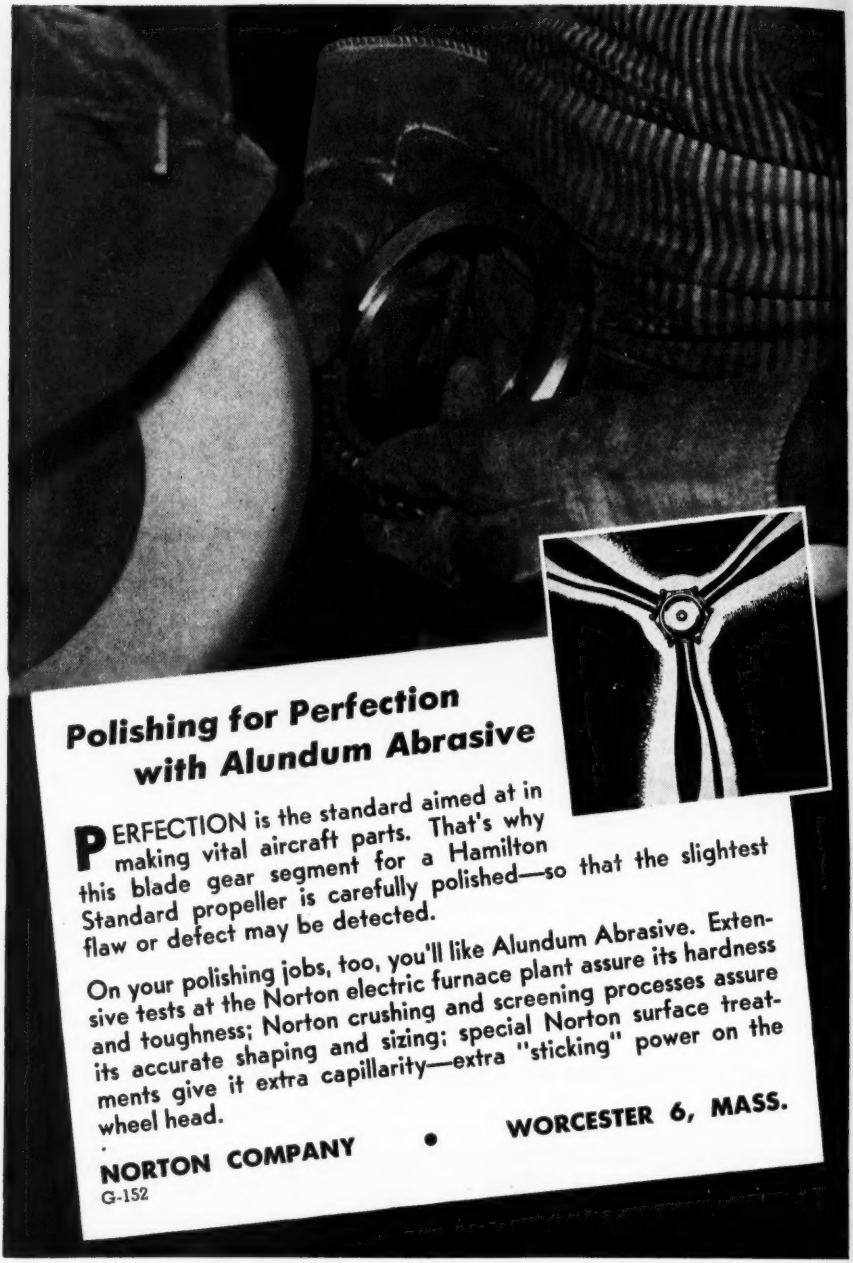
Technical Service Representatives Located in All Principal Cities of the United States and Canada

OAKITE MATERIALS · METHODS · SERVICE

CLEANING FOR EVERY CLEANING REQUIREMENT



Polishing for Perfection with Alundum Abrasive

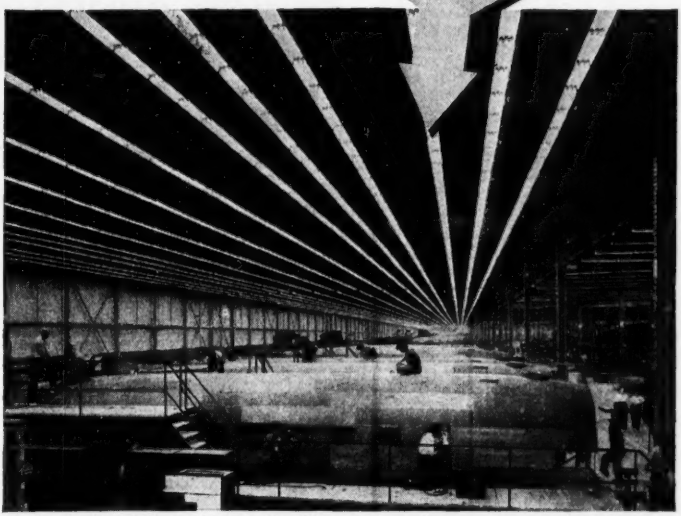
PERFECTION is the standard aimed at in making vital aircraft parts. That's why this blade gear segment for a Hamilton Standard propeller is carefully polished—so that the slightest flaw or defect may be detected.

On your polishing jobs, too, you'll like Alundum Abrasive. Extensive tests at the Norton electric furnace plant assure its hardness and toughness; Norton crushing and screening processes assure its accurate shaping and sizing; special Norton surface treatments give it extra capillarity—extra "sticking" power on the wheel head.

NORTON COMPANY • **WORCESTER 6, MASS.**

G-152

88% reflectance HERE means



The Douglas Aircraft Plant, Oklahoma City, Okla.—design and construction by the Austin Company.

A NEW HIGH IN BETTER LIGHTING

The newest contribution to better lighting is the development of fibre board fluorescent reflectors which, when finished with Polymerin*, have reflectance values of 87 to 88%—considerably higher than the standard for porcelain enamel! And accelerated testing, representing a year's use, shows a reflectance drop of less than half a point!

These wallboard reflectors are sprayed with A&W No. 17 White Surfacer, a primer which has excellent filling qualities and which does *not* require sanding. The topcoat is No. 52A High Reflectance Polymerin—a pure White Polymerin with a hard mar-resistant finish of superior reflectance value.

An ingenious, forward-looking answer to the unavailability of metal for reflectors, this new development is typical of results obtained when Ault & Wiborg chemists are given the opportunity to cooperate with manufacturers on their finishing problems. If you are seeking an improved finish—whether it's for a wartime or peacetime product—the most effective way to find it is to let us go to work on the problem with you *right now!* Time flies, you know, and it's never too soon to get started!

Ault & Wiborg Corporation, a Subsidiary of Interchemical Corporation, Empire State Building, 350 Fifth Avenue, New York 1, N. Y.

***"In postwar planning it is conservative to be optimistic. If we are prepared for an early conclusion of this war, we can avoid an industrial Pearl Harbor."*—Lyman Hill, Director of Sales Research, Servel, Inc.**

AULT & WIBORG CORPORATION

Makers of Polymerin*—the original Speed-bake Finish

**Reg. U. S. Pat. Off*

MR. TAYLOR: A good idea, Mr. Neilson — but I thought everyone knew about the merits of PREP PRODUCTS.

MR. NEILSON: Well, I believe many paint superintendents do not understand that PREP PRODUCTS will clean the metal, remove rust and provide a better bond between the paint and metal surfaces.

MR. TAYLOR: Yes, while we know this, it is quite likely that these men do not, for instance, appreciate the value of PREPRITE, which provides a phosphate coating on ferrous metal surfaces.

NEILSON CHEMICAL

MR. NEILSON: That's right, John — and I wonder how many men know of the value of GALVAPREP on all zinc-coated surfaces before painting.

MR. TAYLOR: Well, while we are about it, why not also tell them about PREPWASH for use in tank systems — and PREP-PIKL for scale removal.

MR. NEILSON: And, about METALPREP —

MR. TAYLOR: Oh yes, we mustn't forget about the excellent job METALPREP is doing in eliminating very severe rust conditions in many war plants, and how we have been of assistance to the Quartermaster Corps, the Ordnance and other War Departments on rust problems.

MR. NEILSON: That's right, there's a lot to be said. Let's do a good job and take a two-page ad so we will have space enough to put this story across, and also drive home the fact that it is not too early to give thought to the importance of including PREP PRODUCTS in post-war planning — something like we have outlined in our Prep Products Bulletin.

Write for PREP PRODUCTS Bulletin

(Representatives Available in Most Sections of the Country)

6564 *Benson Street*

COMPANY *Detroit 7, Mich.*

"We just can't get a good black on these parts, Jim"

When steel finishing problems arise; when the process that you may be using won't blacken the part uniformly, don't let your finishing man say, "It can't be done." Let Du-Lite help you.

Many times Du-Lite "know how" has pointed the way, and a manufacturer, stuck with a black oxide finishing problem, has carried on successfully. Special, heat treated parts, cyanide hardened, frequently cause trouble. We have helped several manufacturers over this pitfall.

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Du-Lite has never been stumped yet. Time and again we have been able to finish satisfactorily, steel parts, where other processes have failed.

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MIDDLETOWN, CONNECTICUT

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By Attaching the NEW

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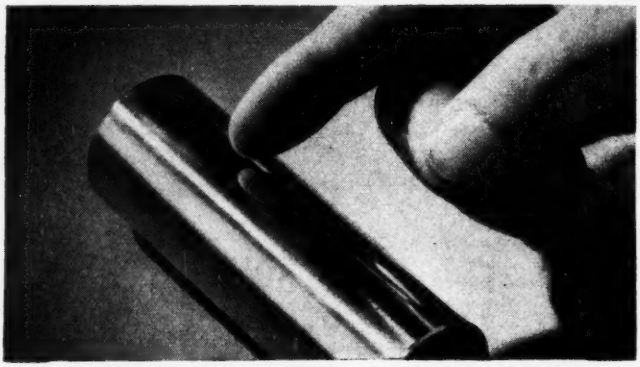
The NEW Metal Cleaning



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● And—creates an extraordinary surface passivity—preventing rust, corrosion, and hand soiling for days

● Solventol No. 27 is a timely advance in the new science of synthetic fluid surface cleaning and conditioning

● A dramatic climax to eleven years of research—and success in major industrial installations

● No. 27 can be used in most standard washers—or our complete engineering service will design faster, specialized units for you

● Telephone, wire or write—Solventol Chemical Products, Inc., 15841 2nd Ave., Detroit, Michigan.

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MODERN SYNTHETIC FLUIDS FOR WATER SPRAY WASHING

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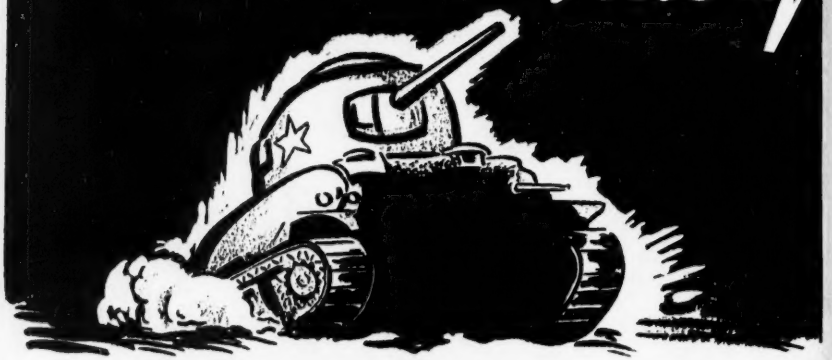

WITH COMPOUNDS DEVELOPED FOR *INDIVIDUAL* CLEANING PROBLEMS

METEX COMPOUNDS. Especially developed compounds for individual cleaning operations on aluminum, alloys, copper and brass.

METALEX COMPOUNDS. For use in tumbling barrels and rotary washers when speed, economy and positive results are essential.

ANODEX. New, hard hitting compounds developed for use with the approved, reverse current **ANODEX PROCESS** for cleaning ferrous metals.

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Learn how to secure a chemically and metallurgically clean basis metal in less time, at lower operating cost by writing today for these interesting, new folders describing the ANODEX process and compounds and 15 different METEX compounds.

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Vital in War

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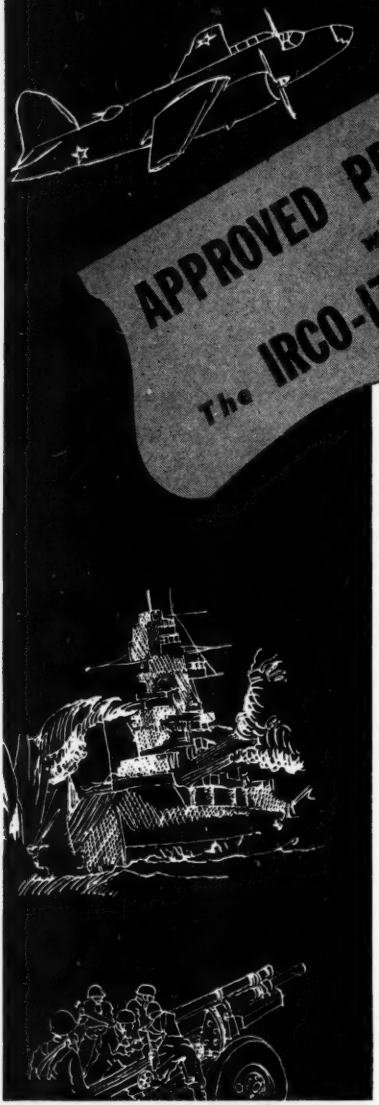
Carlstadt **New Jersey**



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Roto-Finish Embraces 5 Operations for Small Parts

★All the various sizes and shapes of parts illustrated were processed by a Roto-Finish method. This shows only the range of small parts which Roto-Finish will uniformly and economically process. Large parts weighing up to 75 pounds are being Roto-Finished in defense plants today.

★This modern, proven method not only removes burrs, fins, tool and die marks, and other surface defects, but it also turns the parts out with a finish which is comparable to the best hand finished operations.

☆Let us demonstrate what Roto-Finish can do to help put your processing of parts on a profitable production basis.

★Send us a number of your parts. We will Roto-Finish them without cost or obligation to you, returning them with complete data as to equipment and materials used, labor costs, time consumed, etc.

★Compare Roto-Finish costs with the costs of your present methods.

★The following list shows the distributors geographically located to best serve your interests:

Wagner Bros., 1249 Holden Ave., Detroit ★ F. B. Stevens, Inc., 510 Third St., Detroit ★ MacDermid, Inc., Waterbury, Conn. ★ Munning & Munning, 202 Emmett St., Newark, N. J. ★ Crown Rheostat & Sup. Co., 1910 Maypole Ave., Chicago ★ Geo. A. Stutz Mfg. Co., 1641 Carroll Ave., Chicago ★ Lasalco, Inc., 2820 La Salle Ave., St. Louis ★ Sommers Bros., 3439 N. Broadway, St. Louis ★ W. M. Fotheringham, 977 Niagara St., Buffalo ★ W. D. Forbes Co., 303 Washington Ave., N., Minneapolis ★ The Reynolds-Robson Sup. Co., 4623 Paul St., Frankford-Philadelphia.

Write for our new folder which fully describes the many advantages of Roto-Finish both in war, and peace-time.

ROTO FINISH

THE STURGIS PRODUCTS CO.

PHONE 717 — 203 JACOB STREET — P. O. BOX 511

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MICCRO *Products* WILL MEET THESE PROTECTIVE COATING REQUIREMENTS

THE protective coating materials manufactured by Michigan Chrome and Chemical Company have a wide range of applications. Listed here are the most important of these, and for which Miccro Products have been specially developed.

ONE OF THESE MATERIALS WILL MEET YOUR NEEDS

MICCRO-SUPREME STOP-OFF LACQUERS

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MICCROLITE

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- Insulation of plating racks used in practically all cleaning and plating cycles.
- Masking parts for hard chrome plating.
- Masking parts for selective hardening.
- Speedy removal of lacquers used for masking parts for hard chrome plating or selective hardening.
- Insulation of wire baskets used in washing and pickling processes.
- Insulation of anodizing racks.
- Protection and beautification of natural and plated finishes.
- Protection of coils used in rust proofing systems.
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If you need a material for any of these purposes, you will find Miccro Products highly effective, extremely economical and easy to apply and remove. Information concerning their use for any specific application will be supplied gladly by any Miccro sales representative or will be sent directly from the plant upon receipt of your inquiry.

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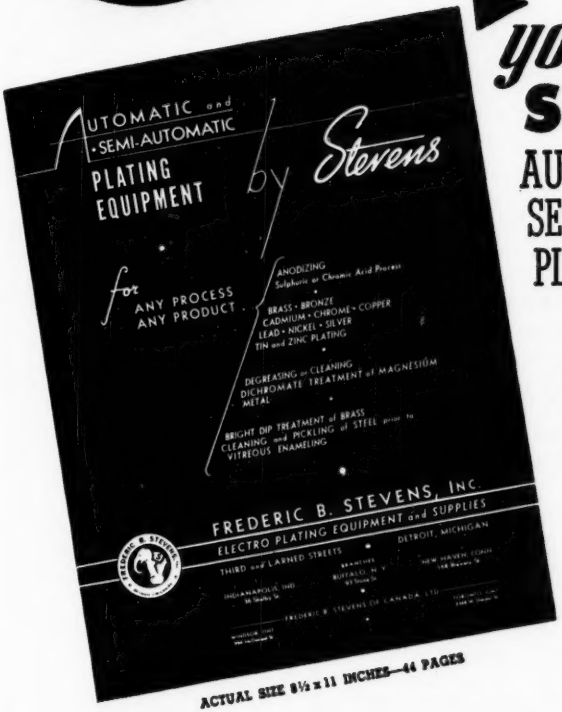
Send for your copy of this NEW STEVENS PLATING EQUIPMENT CATALOG

Just off the Press

your NEW STEVENS AUTOMATIC and SEMI-AUTOMATIC PLATING EQUIPMENT CATALOG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for ANY PROCESS ANY PRODUCT
ANODIZING Sulphuric or Chromic Acid Process
BRASS • BRONZE CADMIUM • CHROME • COPPER LEAD • NICKEL • SILVER TIN and ZINC PLATING
DEGREASING or CLEANING DICHROMATE TREATMENT of MAGNESIUM METAL
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ELECTRO PLATING EQUIPMENT and SUPPLIES
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Illustrates and describes many changes and improvements which have been incorporated in this outstanding line of Plating Equipment.

★

Contains much valuable information on plating practices for those in the metal finishing industry.

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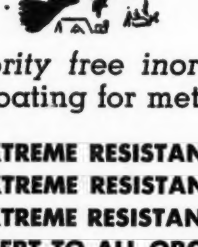
From the BLACK MAGIC Laboratory--

A New War-Time Protective Coating

SILCO



Invention, research, good metal finishing technique and a management undaunted by 5000 experiments combined to produce it.

A *priority free inorganic, non-inflammable vitreous type* coating for metal, combining these features:

EXTREME RESISTANCE TO CORROSION
EXTREME RESISTANSE TO ABRASION
EXTREME RESISTANCE TO HEAT "ZERO TO 1000° F."
INERT TO ALL ORGANIC SOLVENTS
RESISTANT TO ACIDS AND MILD ALKALIS
POSITIVELY NON-INFLAMMABLE

Meets all requirements Quartermaster Corps. Tentative specification J.Q.D. No. 320 for "coating, ceramic lusterless corrosive resisting, for ferrous metals."

Now being used in War production, saving critical materials.

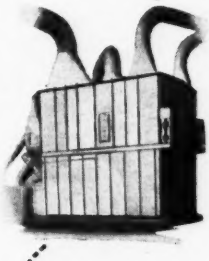
SILCO is sprayed, dried at 200° F. and cured at the low temperative of 350° F. using convection type ovens or infra-red.

Write for information and samples.

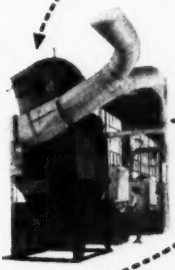
MITCHELL - BRADFORD CHEMICAL CO.
BRIDGEPORT, CONN.

DUST *and* FUME CONTROL *is a job for...* ENGINEERING *Specialists*

Clean, dry, returnable air required. Cloth filter selected.



Wet process air cleaning using Roto-clone.



Centrifugal separator suitable for heavy dust concentration.

Combination of Centrifugal Separator and Dry Filter.

Each unit in a dust or fume control system must be the *right* unit for the particular kind and condition of dust and air present. Selection of the correct, most efficient units—wet, dry, or centrifugal—from the various makes available, is too important for mere hit-or-miss judgment. Like any other complex mechanical project, the planning of a really efficient dust and fume control system is decidedly a job for *engineering specialists.*

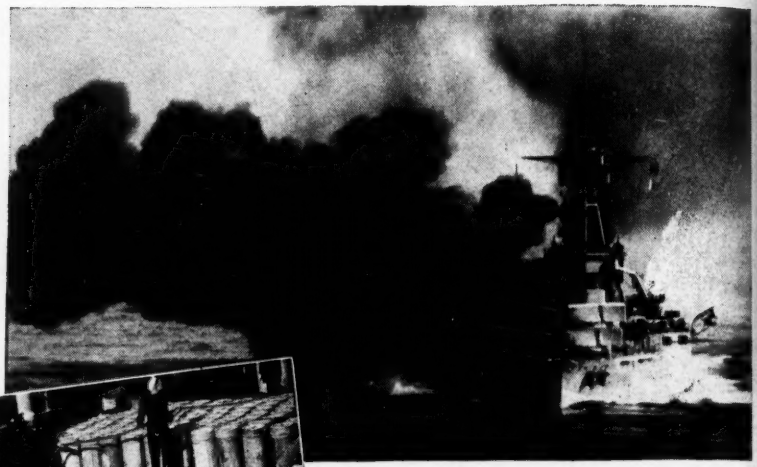
For over 36 years, the Kirk & Blum Engineering Staff has specialized in this particular field. First, our Staff makes a thorough analysis of your special dust or fume control problem. Next, the right units for your *job* are selected from among the various makes available. Finally, our Staff *designs* and *installs* a complete system that is *guaranteed* by Kirk & Blum to give the results you want.

Don't risk serious loss of time and money. Don't let guesswork leave you "stuck" with units that are not right for your particular job. Get the unbiased counsel and planning of experts—Kirk & Blum Engineers. For details write . . .

THE KIRK & BLUM MANUFACTURING CO.
2816 Spring Grove Avenue **Cincinnati, Ohio**

Other equipment designed and installed by Kirk & Blum . . . "Cooling Systems for the Glass Industry," "Industrial Ovens."

KIRK AND BLUM
AN ORGANIZATION OF ENGINEERS AND MECHANICS



U. S. Navy
Official Photos

Of Course We Have It!

THAT NEW AMMUNITION PRIMER (U. S. Ordnance Dept. "Spec" AXS-946) for Steel Shells, Bombs and Cartridge Cases

Meets every requirement—yours and Uncle Sam's. Top speed and economy in the finishing department, full surface protection to the ammunition. The chances for corrosion to mar the effectiveness of our calling cards for Hitler and Tojo are greatly reduced when they're finished with EGYPTIAN Primer AXS-946 and top coated with EGYPTIAN enamel,—lacquer or synthetic.

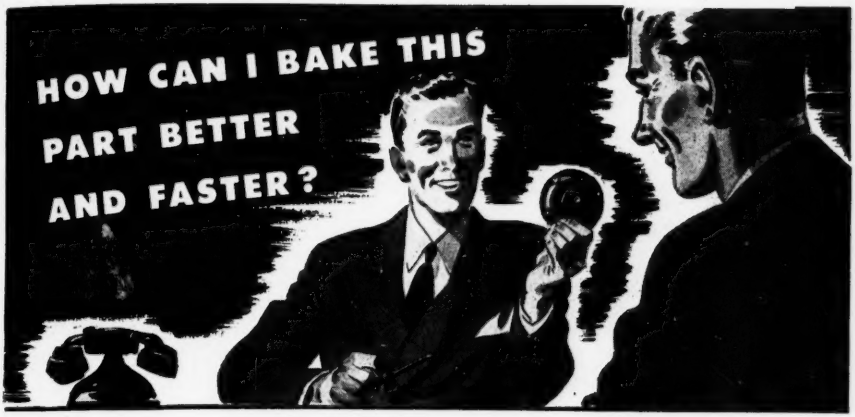
This red EGYPTIAN priming coat developed to meet "Spec" AXS-946 may be applied to the bare metal by spray, brush or dip. When applied by spray it air dries in ten minutes for handling and top coating with enamel. If desired it may be baked for ten minutes at 250° F.

You can depend on EGYPTIAN alertness to meet new and revised Government Specifications, just as you can depend on the quality of every EGYPTIAN FINISH.

Send for Revised "Spec" Book PF

THE EGYPTIAN LACQUER MANUFACTURING CO.
Rockefeller Center – New York 20, N. Y.

EGYPTIAN
***Superior* FINISHES**



DESPATCH HAS THE ANSWER!

Completely revolutionary in every detail, Despatch's spectacular *new* line of finish-baking ovens is purposely designed to answer *all* requirements—for speed . . . improved quality . . . automatic operation . . . greater economy . . . use of floor space.

Employing radically different mechanical devices and electronic equipment, these ovens represent Despatch's greatest advance in 41 years experience in this field. And the greatest departure from older methods in baking.

Free! **Plant Layout Service**

Let a Despatch engineer prepare a post-war layout for **your** plant now.

His recommendations will help you hold your own in tomorrow's markets.

Announcing

THE CHANGE OF OUR NAME

to

DETREX
ORPORATIO

Over a period of many years the trade name "Detrex" has identified the products of this company. We feel that its adoption as our corporation name is singularly appropriate.

This change of name in no way affects the personnel, ownership, or policies of this organization.